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FINAL OPERATIONS AND MAINTENANCE PLAN FOR SOIL VAPOR EXTRACTION CONTAINMENT SYSTEM SITE 1 NWIRP BETHPAGE NY

6/25/2010

TETRA TECH EC

DEPARTMENT OF THE NAVY
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Final Operation & Maintenance Plan for Soil Vapor Extraction Containment System Site 1, Former Drum Marshalling Yard at Naval Weapons Industrial Reserve Plant Bethpage, New York

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LIST OF ACRONYMS AND ABBREVIATIONS

APP	Accident Prevention Plan
CAA	Clean Air Act
CDL	Commercial Driver's License
CERCLA	Comprehensive Environmental Response, Compensation and Liability Act
COC	Chain of Custody
DAR	Division of Air Resources
DQOs	Data Quality Objectives
ECL	Environmental Conservation Law
EHS	Environmental Health and Safety
EPP	Employee Participation Program
GOCO	Government Owned Contractor-Operated
GPM	Gallons per minute
HP	Horsepower
IRP	Installation Restoration Program
kW	Kilowatts
LCP	Local Control Panel
LO/TO	Lock-out and Tag-out
MCC	Motor Control Center
NAAQS	National Ambient Air Quality Standards
NAVFAC	Naval Facilities Engineering Command
NCPD	Nassau County Police Department
NGC	Northrop Grumman Corporation
NWIRP	Naval Weapons Industrial Reserve Plant
NYCRR	New York Codes, Rules and Regulations
NYSDEC	New York State Department of Environmental Conservation
O&M	Operation & Maintenance
OSHA	Occupational Safety and Health Administration
PCE	Perchloroethene
PESM	Project Environmental and Safety Manager
PLC	Programmable Logic Controller
PPE	Personal Protective Equipment
QA	Quality Assurance
QAPP	Quality Assurance Project Plan
QC	Quality Control
RODs	Records of Decision
RPM	Revolutions per minute
SCFM	Standard cubic feet per minute
SHSO	Site Health and Safety Officer
SHSP	Site-specific Health and Safety Plan
SOP	Standard Operating Procedure
SVECS	Soil Vapor Extraction Containment System
SVEW	Soil Vapor Extraction Well
SVPM	Soil Vapor Pressure Monitor
SVOCs	Semivolatile organic compounds
TtEC	Tetra Tech EC, Inc.
TCE	Trichloroethene
USEPA	United States Environmental Protection Agency
VOCs	Volatile organic compounds
ZIP	Zero Incident Performance

1.0 INTRODUCTION

Tetra Tech EC, Inc. (TtEC) has prepared this Operation & Maintenance Plan (O&M Plan; Plan) for the Soil Vapor Extraction Containment System (SVECS) for Site 1, Former Drum Marshalling Area (Site; Figure 1-1) at the Naval Weapons Industrial Reserve Plant (NWIRP) in Bethpage, New York, for the United States Department of the Navy (Navy), Naval Facilities Engineering Command (NAVFAC), Mid-Atlantic, under Remedial Action Contract No. N62473-07-D-3211,Contract Task Order No. WE04. This SVECS has been designed by TtEC as based on the Design Analysis Report (TtNUS, April 2009), with support from various subcontractors for the remediation of contaminated soils and shallow groundwater within the Upper Glacial Formation at Site 1 containing chlorinated volatile organic compounds (VOCs) that are present in a clay unit near the water table. The equipment needed for the SVECS has been provided by various subcontractors (Tetrasolv Filtration, Bisco Environmental, and others). Construction of the SVECS has been performed under TtEC's supervision by various subcontractors including Bensin Contracting and Delta Well and Pump Company, Inc. The SVECS treatment operations will be conducted in the Treatment Building (existing unoccupied building number 03-35) located within the fenced area of NWIRP Bethpage (see Figure 1-2). The soil vapor that is extracted from twelve intermediate and deep soil vapor extraction wells (SVEWs) will be treated in Building Number 03-35 to meet the effluent limitations and monitoring requirements contained in the NY State Division of Air Permit Equivalent dated December 3, 2009, submitted to the New York State Department of Environmental Conservation (NYSDEC).

The cleanup remedy for the Site 1 contaminated soils and shallow groundwater was originally set forth in the 1995 Record of Decision (ROD). The selected remedy was chosen in accordance with the New York State Environmental Conservation Law (ECL) and the Navy's Installation Restoration Program (IRP). It is also consistent with the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA), as amended, 42 U.S.C. §§ 9601-9675.

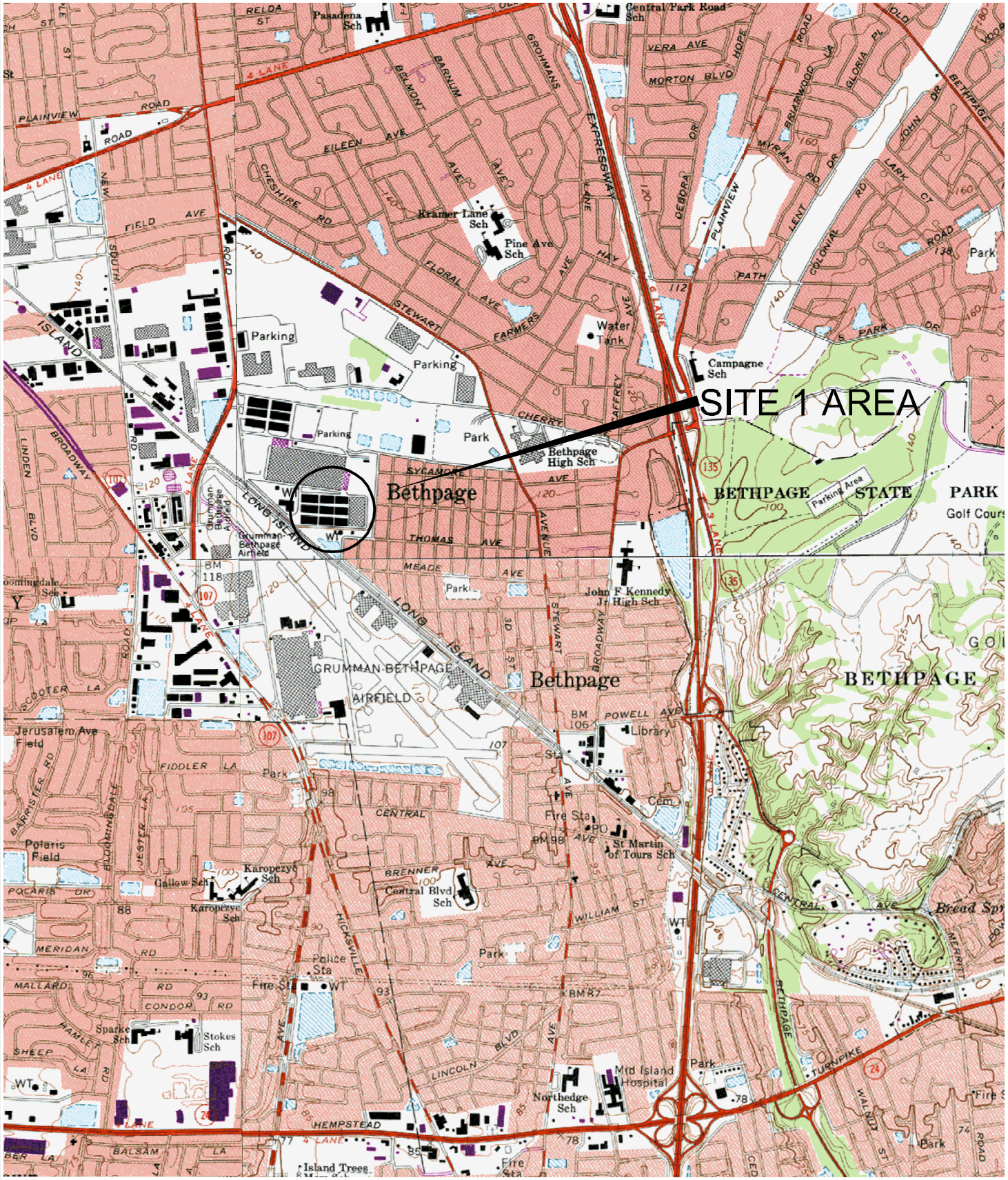
1.1 Purpose

This O&M Plan was written to provide a generalized set of instructions of the methods and procedures required to maintain and operate the SVECS at the site. This Plan includes information pertaining to the operation and maintenance of the facility, site security, regulatory requirements for plant operation, management of plant records, qualifications of plant personnel, sampling and analysis requirements, health and safety procedures, and waste handling procedures.

This Plan is supplemented by equipment manufacturer O&M manuals for each equipment component. As the project progresses, additional equipment manufacturer O&M information may be added, as it is obtained. This Plan is to be treated as a living document that will require periodic updating as information and operational experience is obtained.

1.2 Organization of the O&M Plan

The purpose of this O&M Plan is to facilitate the understanding of key operations and maintenance features of this facility. The following gives a brief overview of the remaining sections of this O&M Plan.



Source: U.S.G.S. Topographic Maps (7.5 Minute)
Amityville, Freeport, Hicksville, Huntington, NY Quadrangles

Department of the Navy
Naval Facilities Engineering Command, Mid–Atlantic

Site 1, Former Drum Marshalling Area
Naval Weapons Industrial Reserve Plant
Bethpage, NY

Figure 1–1
Site Location Map

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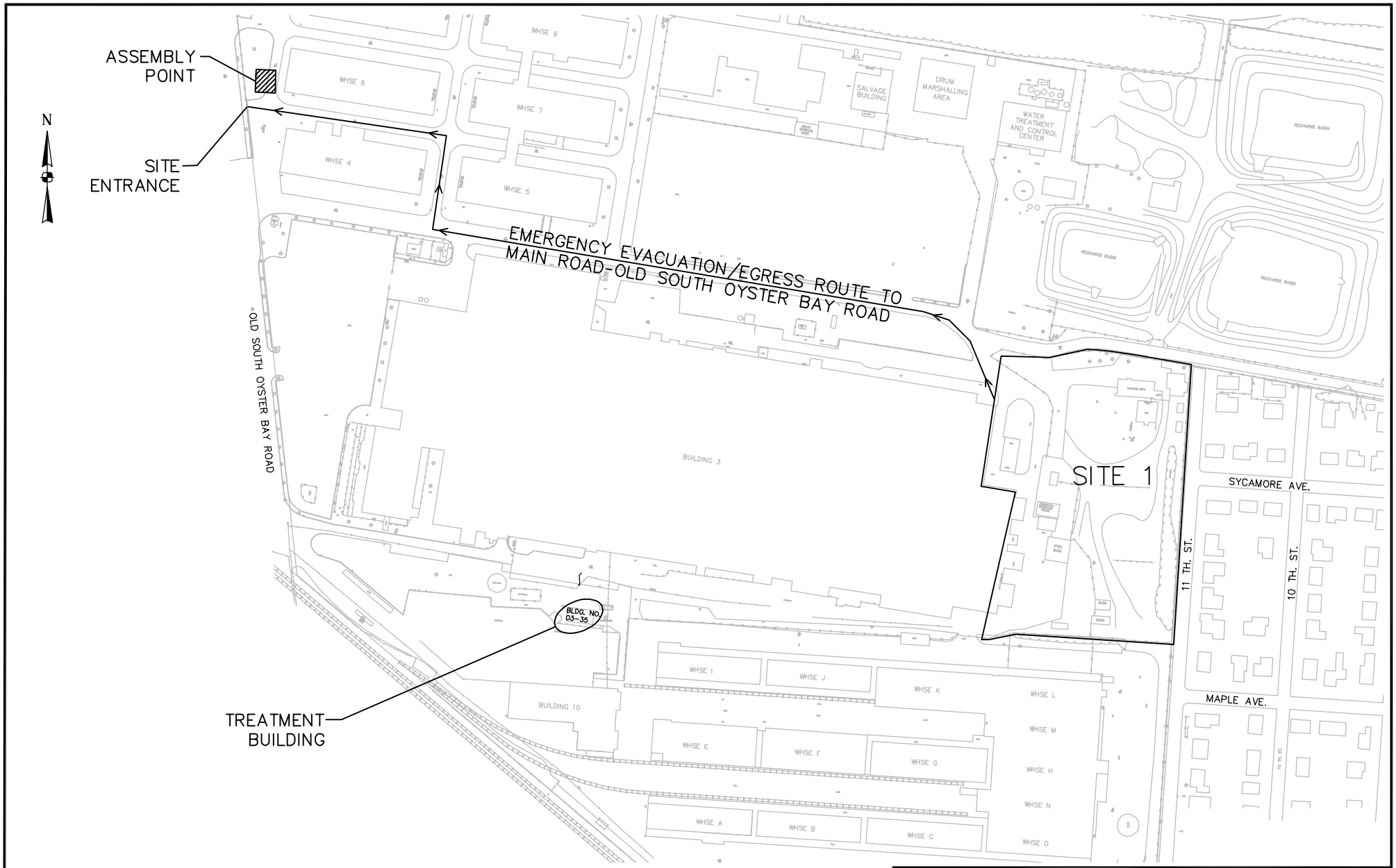

Department of the Navy
Naval Facilities Engineering Command, Mid-Atlantic

Site 1, Former Drum Marshalling Area
Naval Weapons Industrial Reserve Plant
Bethpage, NY

Figure 1-2
Site 1 Area and Vicinity

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- ***Section 2.0, Regulatory Compliance,*** outlines local, state and federal codes and regulations pertaining to the operation and maintenance of the SVECS. The air permit emissions criteria and monitoring requirements for the discharge of treated off-gas and other operational requirements are contained in this section.
- ***Section 3.0, Records Management,*** describes record keeping forms and procedures for recording data from the operation and maintenance of the SVECS. Samples of the required record keeping forms are contained in Appendix A, ***Report Forms***.
- ***Section 4.0, Sampling and Analysis Program Description,*** outlines the schedule and procedures for sampling and analyzing the various influent, intermediate, and effluent process streams associated with the operation of the SVECS. Adherence to the quality standards and schedules for sampling and analysis described in this section are critical to the compliant, safe and efficient operation of the SVECS.
- ***Section 5.0, Health and Safety,*** contains safety standards and procedures for all aspects of SVECS operation and maintenance. This section along with the Site-Specific Health and Safety Plan (SHSP) and the Accident Prevention Plan (APP) must be consulted prior to the execution of any tasks performed by Operators and subcontractors to ensure they are performed in compliance with applicable safety procedures.
- ***Section 6.0, Process Description and Operation,*** describes the functions and relationships of the major pieces of equipment in the three process loops of the SVECS. Manual electronic controls and equipment interlocks are detailed in this section. Set points and ranges of operational parameters for normal function of the soil vapor treatment process are found in this section.
- ***Section 7.0, Operations,*** contains procedures for the daily operation of process equipment. Start-up and shut-down procedures and equipment specifications for the major process equipment are included in this section.
- ***Section 8.0, System Troubleshooting,*** highlights procedures for diagnosing and solving problems with the major pieces of equipment in the SVECS. Additional troubleshooting information is also found in Appendix D, ***Manufacturer's Operation and Maintenance Manuals***.
- ***Section 9.0, Equipment Maintenance,*** includes a matrix (under preparation) outlining the schedule and procedures for performing preventive maintenance on system equipment. This section also describes maintenance record keeping procedures and instructions for housekeeping and the general upkeep of the SVECS.
- ***Section 10.0, Waste Transportation and Disposal,*** describes the requirements for on-site storage, marking, transportation, and disposal of all liquid and solid waste generated at the SVECS. This section includes the requirements for selecting and approving subcontractors to handle and dispose of the waste generated at the facility, as well as record keeping requirements for waste generation and disposal.

1.3 Using the O&M Plan

The purpose of this O&M Plan is to facilitate the understanding of key operations and maintenance features of the SVECS. A cursory review of this Plan by a new Operator will not qualify him/her to operate and maintain the facility. Side-by-side training with an experienced Operator and a comprehensive review of this O&M Plan are recommended to qualify a new Operator.

This O&M Plan should be updated periodically to remain current. The Plan should be revised when new and improved techniques are devised for operating and maintaining the SVECS.

1.4 Site Location

NWIRP Bethpage is located in east central Nassau County, Long Island, New York, approximately 30 miles east of New York City. The Navy's property totaled approximately 109.5 acres and was formerly a Government Owned Contractor-Operated (GOCO) facility that was operated by the NGC until September 1998. NWIRP Bethpage is bordered on the north, west, and south by property owned, or formerly owned, by NGC that covered approximately 605 acres, and, on the east, by a residential neighborhood.

Site 1 (see Figures 1-1 and 1-2) lies within the fenced area of NWIRP Bethpage and is located east of Plant No. 3, west of 11th Street and north of Plant 17 South.

1.5 Site Background

NWIRP Bethpage is currently listed by NYSDEC as an "inactive hazardous waste site" (#1-30-003B), as is NGC (#1-30-003A) and the Hooker/RUCO site (#1-30-004) located less than 1/2 mile west of NWIRP Bethpage.

NWIRP Bethpage was established in 1941. Since inception, the primary mission of the facility has been the research, prototyping, testing, design engineering, fabrication, and primary assembly of military aircraft. The facilities at NWIRP Bethpage include four plants (Nos. 3, 5, and 20, used for assembly and prototype testing; and No. 10, which contains a group of quality control laboratories), two warehouse complexes, a salvage storage area, water recharge basins, an industrial wastewater treatment plant, and several smaller support buildings.

Historical operations that resulted in hazardous material generation at the facility included metal finishing processes, maintenance operations, painting of aircraft and components, and other activities that involve aircraft manufacturing. Wastes generated by plant operations were disposed directly into either drainage sumps, dry wells, and/or on the ground surface, resulting in the disposal of a number of hazardous wastes, including VOCs, semivolatile organic compounds (SVOCs), polychlorinated biphenyls (PCBs), and the inorganic analytes, chromium and cadmium at the site. Some of these contaminants have migrated from the points of disposal to surrounding areas, including the soils of these sites and the groundwater beneath and downgradient of the NWIRP Bethpage property.

Remedial Investigations conducted in the early 1990s identified VOC-contaminated soils and shallow groundwater at Site 1 that were contributing to a regional groundwater plume [Halliburton NUS (HNUS) 1993]. To address this contamination, a 1995 ROD was prepared that included in-situ treatment of VOCs, excavation and offsite disposal of soils contaminated with PCBs, and placement of a permeable cover to address other residual contaminants including cadmium, chromium, and VOCs.

Soils at Site 1 consist mainly of unconsolidated sediments that overlie crystalline bedrock. The unconsolidated sediments consist of four distinct geologic units that in descending order are the Upper Glacial Formation, the Magothy Formation, the Raritan Clay, and the Lloyd Formation. For the SVECS at Site 1, the subsurface conditions consist of the Upper Glacial Formation, which is about 30 to 45 feet thick, consists chiefly of coarse sands and gravels. A clay unit is present near the groundwater table [50 feet below ground surface (bgs)] at the southeast corner of the site. This clay unit is suspected to be a source of chlorinated solvents that are migrating into the overlying soil gas and the source of offsite VOCs in soil vapor.

Chlorinated solvents including trichloroethene (TCE), tetrachloroethene (PCE), and 1,1,1-trichloroethane (TCA) have been identified as the VOCs of interest in soil gas at the site. Concentrations greater than 1,000 µg/m3 (micrograms per cubic meter of soil vapor) have been directly associated with Site 1

activities and historical environmental data, and based on preliminary screening, exceed guidelines established by the New York State Department of Health (NYDOH) for subslab soil vapor concentrations. Of these chemicals, TCE is the primary VOC of concern. Addressing TCE contamination in accordance with DOH guidance should address the other VOCs associated with the site (NYSDOH, 2006).

PCBs, cadmium, and chromium have also been identified in site soils at concentrations requiring remediation. The majority of these chemicals have been detected in the central portion of Site 1. Based on limited data, these chemicals are not expected to be present along the fence line at environmentally significant concentrations (i.e., trigger handling as hazardous waste).

1.6 Project Overview and Objectives

The remedial objective for this project is to use an on-site soil vapor extraction system to prevent further off-site migration of VOC contaminated soil vapor and to the extent practical, capture contaminated soil vapor with a TCE concentration greater than 250 ug/m^3. A secondary objective of this project is to address soil vapor with a TCE concentration greater than 5 ug/m^3 (*Design Analysis Report for Soil Vapor Extraction Containment System,* TtNUS, April 2009). The SVECS has been designed for a 4 year operational life.

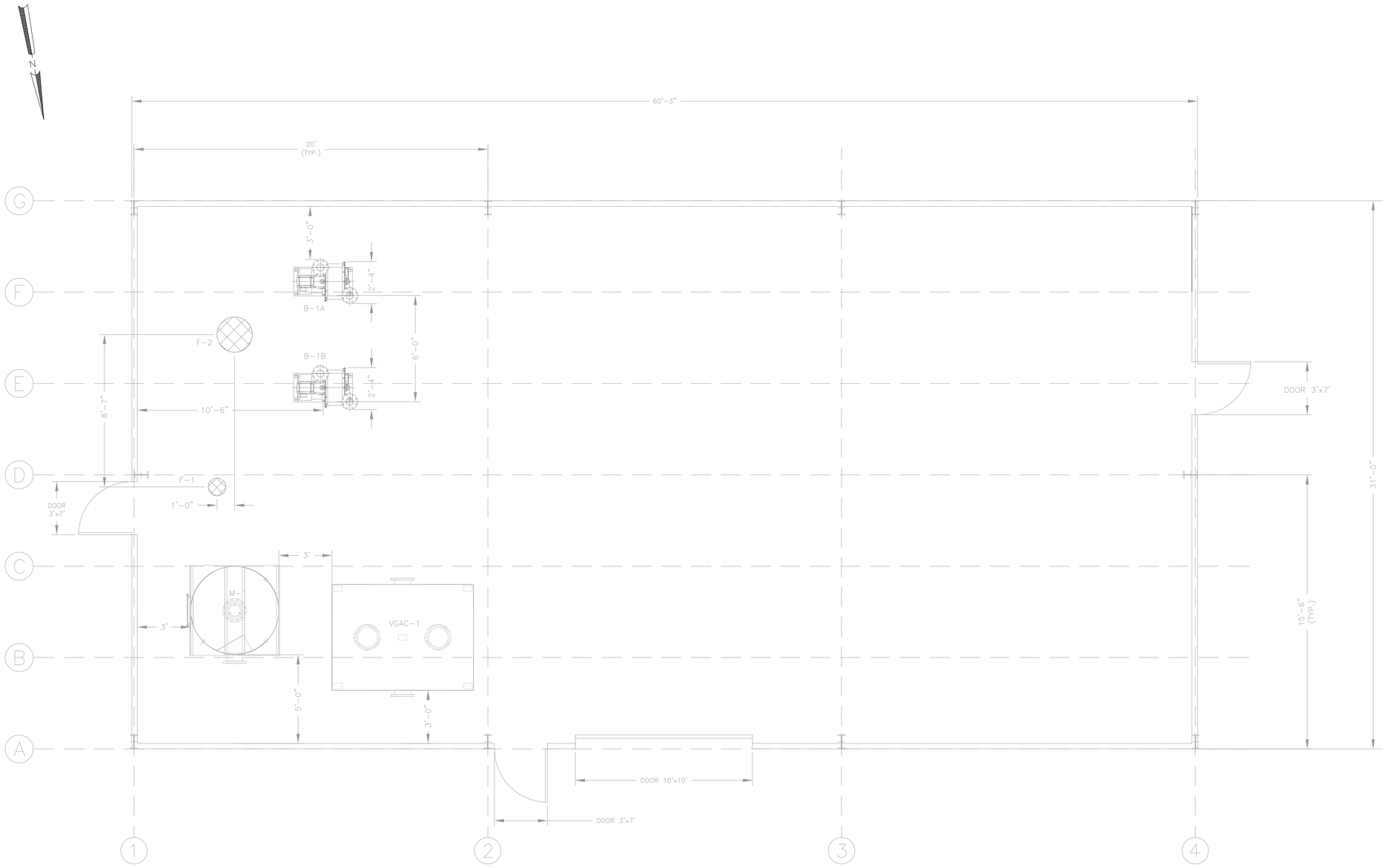
Six soil vapor extraction well (SVEW) clusters, each consisting of an intermediate and deep well, will be utilized for the extraction of soil vapors during the system operation. The six deep SVE wells are also capable of being used as monitoring wells for collecting groundwater samples. However, at this time, the Navy has determined that collection of groundwater samples will not be required. TtEC will not collect groundwater samples as part of the installation and operation of the SVECS. The six intermediate SVE wells will not encounter groundwater and will only be used for soil vapor extraction. Twelve soil vapor pressure monitors (SVPMs) will be used to monitor the effectiveness of the system in capturing and containing the contaminated soil vapors in the area east of Site 1. The soil vapor monitoring and sampling and the exit strategy are discussed further in Section 4.

1.7 General Description of Site 1 SVECS

The SVECS consists of soil vapor extraction, soil vapor monitoring, and soil vapor treatment. The twelve SVEWs are located along the eastern boundary of the Site in six clusters. Twelve SVPMs are located east and southeast of the SVEWs along 9th and 10th Streets and along Maple Avenue and Sycamore Avenue. Each SVEW has been piped below the ground to the Flow Monitoring Station, where flow, vacuum and vapor quality can be monitored. The Flow Monitoring Station consists of an 8 ft wide x 8 ft tall x 20 ft long Conex box located in the southeast corner of the Site. All the SVE lines collect into a single manifold within the Flow Monitoring Station and from this location a single underground pipeline has been routed to the Treatment Building (Building 03-35). The Treatment Building is an existing unoccupied building 31 ft wide x 60 ft long. The north side of the building is equipped with a 10 ft wide x 10 ft high overhead door. The Treatment Building also has three 3 ft x 7 ft doors on the north, east and west sides. The soil vapor treatment consists of moisture separation and off-gas treatment using vapor-phase granular activated carbon to remove the chlorinated VOCs. All of the treatment operations within Building 03-35 will be conducted in a 20 ft x 31 ft area on the eastern side. The layout plan for the SVECS is shown on Figure 1-3.

NOTES:

1. ALL MAN DOORS AND OVERHEAD DOORS ARE EXISTING. MAN DOORS ARE APPROXIMATELY 7'X3'. OVERHEAD DOOR IS APPROXIMATELY 10'X10'.



PROCESS EQUIPMENT LIST		
ITEM NUMBER	NUMBER REQUIRED	NAME/DESCRIPTION
M-1	1	MOISTURE SEPARATOR -CONFIGURATION: VERTICAL, CYLINDRICAL -MATERIAL OF CONSTRUCTION: CARBON STEEL, EPOXY INTERIOR COATING, PAINT EXTERIOR COATING -CAPACITY: 400 GALLON CONDENSATE COLLECTION -DIMENSIONS: 5 FT DIA X 6 FEET HT, 718 GALLON
F-1	1	MAKE-UP AIR FILTER -CONFIGURATION: INTAKE FILTER/SILENCER COMBINATION HOUSING -MATERIAL OF CONSTRUCTION: CARBON STEEL, CORROSION RESISTANCE COATING -CAPACITY: 500 CFM AT 20 IW, 4 INCH FLANGED CONNECTION
F-2	1	BLOWER AIR FILTER -CONFIGURATION: INLINE VACUUM SERVICE FILTER -MATERIAL OF CONSTRUCTION: CARBON STEEL, CORROSION RESISTANCE COATING -CAPACITY: 1,200 CFM AT 35 IW, 10 INCH FLANGED CONNECTION
B-1A, B-1B	2	SOIL VAPOR EXTRACTION BLOWER -CONFIGURATION: HORIZONTAL CENTRIFUGAL -RATING: 600 CFM AT 40 IW -MOTOR: 7.5 HP, 460V, 3PH, 60HZ, ODP
VGAC-1	1	VAPOR-PHASE GRANULAR ACTIVATED CARBON -CONFIGURATION: RECTANGULAR TANK -MATERIAL OF CONSTRUCTION: CARBON STEEL, EPOXY INTERIOR COATING, EPOXY EXTERIOR COATING -RATING: 1,600 CFM AT 3 IW, 2,000 CFM AT 6 IW -CAPACITY: 5,000 LBS CARBON -DIMENSIONS: 6' X 8' FOOTPRINT, 6' 8" HT

3 0 3 6

1" = 3'

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REV	DESCRIPTION	PREP BY	DATE	APPRVD
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BETHPAGE, NEW YORK
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DEPARTMENT OF THE NAVY
NAVAL WEAPONS INDUSTRIAL RESERVE PLANT
SITE 1, FORMER DRUM MARSHALLING AREA
SOIL VAPOR EXTRACTION CONTAINMENT SYSTEM
LAYOUT PLAN
APPROVED
DATE

SEAL AREA

SAT TO DATE

CODE I.D. NO.

SCALE : AS SHOWN

SPEC. NO.

CONSTRN. CONTR. NO.
N62473-10-D-3211

NAVFAC DRAWING NO.

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DIS. SH. NO.
1-3

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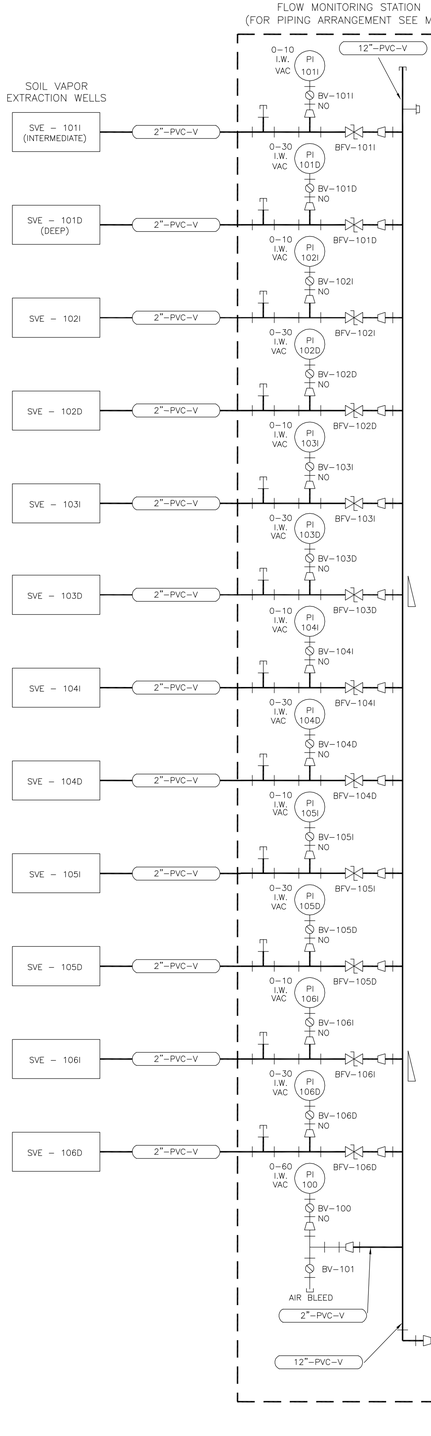
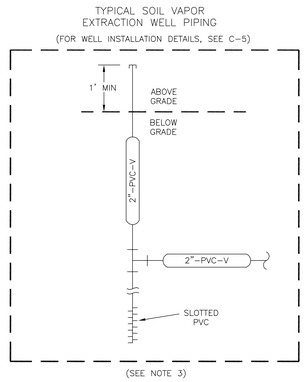
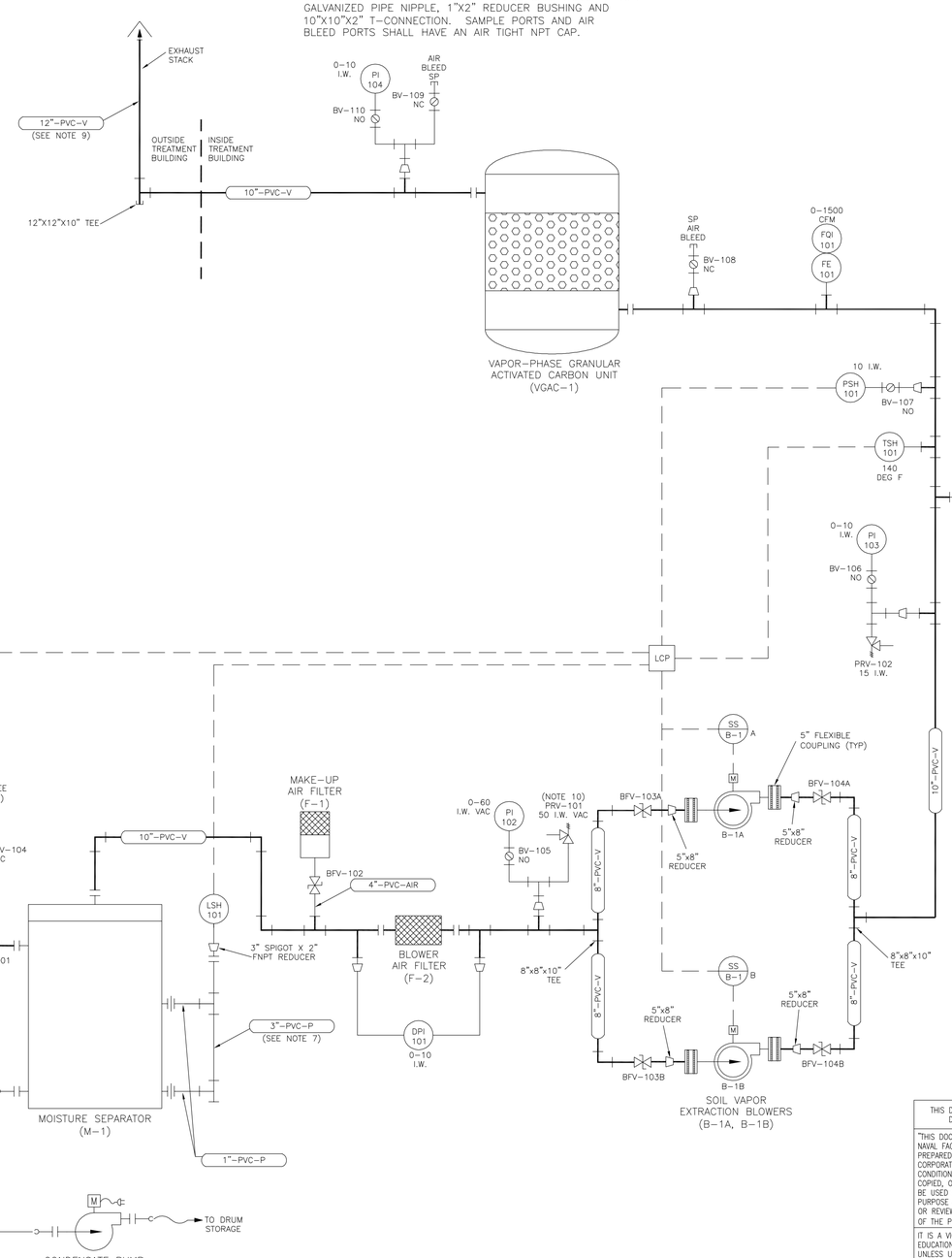




NOTES:

1. THE BASIS OF DESIGN AND REMEDIAL OBJECTIVES FOR THE SVE CONTAINMENT SYSTEM CAN BE FOUND IN DETAIL IN "DESIGN ANALYSIS REPORT FOR SOIL VAPOR EXTRACTION CONTAINMENT SYSTEM" (TTNUS, APRIL 2009)
2. FLOW MONITOR PORTS SHALL BE 1" NPT AND CONNECTED TO THE MAIN PROCESS PIPING BY USE OF T-CONNECTION. FLOW MONITOR PORTS SHALL HAVE AN AIR TIGHT NPT CAP.
3. ALL WELL HEAD ASSEMBLIES ARE SIMILAR CONSTRUCTION. SEE DRAWING C-5 FOR INSTALLATION DETAILS.
4. ALL UNDERGROUND PIPING SHALL SLOPE TOWARD CONDENSATE CLEANOUT PORTS. CONDENSATE CLEANOUT PORTS SHALL BE LOCATED AS IDENTIFIED ON DRAWING C-2. ADDITIONAL PORTS MAY BE NECESSARY, OR THE PROPOSED MAY REQUIRE RELOCATION AT LOW POINTS IN PIPE ROUTE. CLEANOUT PORTS SHALL HAVE AN AIR TIGHT CAP. SEE DRAWING C-5 FOR INSTALLATION DETAILS.
5. SAMPLE PORT AND AIR BLEED PORTS SHALL BE 1" NPT AND CONNECTED TO THE MAIN PROCESS PIPING BY USE OF 1" NPT GALVANIZED PIPE NIPPLE, 1" NPT BRASS BALL VALVE, 1" NPT GALVANIZED PIPE NIPPLE, 1"X2" REDUCER BUSHING AND 10"X10"X2" T-CONNECTION. SAMPLE PORTS AND AIR BLEED PORTS SHALL HAVE AN AIR TIGHT NPT CAP.
6. PRESSURE INDICATORS SHALL BE 1/2" NPT AND CONNECTED TO THE MAIN PROCESS PIP'ING BY USE OF 1/2" NPT GALVANIZED PIPE NIPPLE, 1/2" NPT BRASS BALL VALVE, 1/2" NPT GALVANIZED PIPE NIPPLE, 1"X2" REDUCER BUSHING AND 10"X10"X2" T-CONNECTION.
7. SIGHT TUBE SHALL BE CONSTRUCTED OF 3" DIAMETER CLEAR PVC PIPE.
8. ALL PIPING SHALL BE SCHEDULE 40 PVC, UNLESS OTHERWISE NOTED.
9. EXHAUST STACK SHALL BE CONSTRUCTED OF 12" SCHEDULE 80 PVC AND EXTEND 5' ABOVE ROOF.
10. INSTRUMENTS SHALL HAVE AN ADJUSTABLE RANGE BETWEEN 0-75 I.W.
11. ABOVE GROUND PIPING THAT IS OUTSIDE SHALL BE INSULATED, INCLUDING PIPING WITHIN THE FLOW MONITORING STATION.



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TETRA TECH ENGINEERING CORPORATION PC

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SUBMITTED BY: (FIRM NUMBER) HD: HD: DIR: PRE: OFFICER IN CHARGE
SOUTHWESTDIV DATE
APPROVED DATE

DEPARTMENT OF THE NAVY
NAVAL FACILITIES ENGINEERING COMMAND, MID-ATLANTIC
NAVAL WEAPONS INDUSTRIAL RESERVE PLANT BETHPAGE, NEW YORK
SOIL VAPOR EXTRACTION, MONITORING, AND OFF-GAS TREATMENT
SITE 1, FORMER DRUM MARSHALLING AREA
PROCESS FLOW DIAGRAM
APPROVED EFANE FOR COMMANDER, NAVFAC
DATE
SEAL AREA

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1.7.1 Design Flow and Influent Concentration

A Process Flow Diagram is presented on Figure 1-4, and illustrates the design flow rates through the soil vapor extraction and treatment process. The SVECS has been designed to process a nominal flow of 600 cubic feet per minute (cfm) and a maximum flow of 1,000 cfm of soil vapor extracted from six intermediate and six deep SVEWs. The mean concentration of VOCs in the influent soil vapor consists of 41,128 $\mu g/m^3$ of trichloroethene, 381 $\mu g/m^3$ of tetrachloroethene, and 20,634 $\mu g/m^3$ of 1,1,1-trichloroethane. The maximum concentration of VOCs in the influent soil vapor consists of 180,000 $\mu g/m^3$ of trichloroethene, 1,200 $\mu g/m^3$ of tetrachloroethene, and 90,000 $\mu g/m^3$ of 1,1,1-trichloroethane. The SVECS is expected to operate continuously 24 hours/day, 7 days/week for approximately four years with the exception of maintenance and adjustment periods.

1.7.2 Soil Vapor Extraction

The soil vapor extraction system consists of twelve SVEWs with 2-inch outside diameter Schedule 40 PVC risers and 0.020 high capacity machine slotted screens, installed in six clusters, each consisting of one intermediate well and one deep well. Intermediate Wells SVE-101I, SVE-102I, SVE-103I, SVE-104I, SVE-105I, and SVE-106I have a screened interval between 25 and 35 ft bgs. Deep Wells SVE-101D, SVE-102D, SVE-103D, SVE-104D, SVE-105D, and SVE-106D have a screened interval between 40 and 60 ft bgs. Each SVEW is expected to be operated at a design flow rate of 50 cfm for a total flow rate of 600 cfm. Each intermediate depth SVEW requires a vacuum of 4 inches of water column (i.w.) and each deep SVEW requires a vacuum of up to 20 i.w. in order in order to extract the contaminated soil vapors from the targeted depths and locations within Site 1. SVE rates for each well will be controlled by local manual valves. A portable velocity meter will be used to measure air flow while adjusting the control valves. Extraction wells with higher contaminant concentrations (based on photo-ionization detector [PID] readings) will be operated at a higher flow rate. Extraction well flow rates will be pulsed periodically (i.e. cycled on/off or adjusted high/low) to prevent stagnant conditions or "dead zones" from developing between adjacent extraction wells. As the remediation progresses, the use of this technique will be evaluated based on field conditions, including long term flow rate fluctuations, pressure variances, mass loading rates and moisture build-up.

All of the piping for the SVECS is Schedule 40 PVC. Piping from the SVEWs to the Flow Monitoring Station is approximately 3,600 linear feet and piping from the Flow Monitoring Station to the Treatment Building is approximately 1,400 linear feet. Within the Flow Monitoring Station, the discharges from the individual SVEWs have been equipped with a 2-inch flow control butterfly valve, a vacuum gauge, and a sampling port. The sampling port can be utilized to measure the flow rate from an individual well using a portable velocity meter and to collect a vapor quality sample. The manifold within the Flow Monitoring Station is a 12-inch diameter Schedule 40 PVC pipe that is equipped with a vacuum gauge and an air bleed port to allow flushing of any condensate that may accumulate in the conveyance line to the Treatment Building. Five condensate cleanout ports are located at low points along this underground pipeline.

1.7.3 Soil Vapor Monitoring

Twelve SVPMs have been installed to monitor the effectiveness of the system in capturing and containing the contaminated soil vapors in the area east of Site 1. All of the SVPMs consist of 1-inch outside diameter Schedule 40 PVC risers and 0.020 high capacity machine slotted screens installed at various depths. The depths of SVPM-2002-S and SVPM-2003-S are 10 ft bgs; the depths of SVPM-2002-I, SVPM-2003-I, SVPM-2004-I, SVPM-2007-I, and SVPM-11S are 25 ft bgs; the depth of SVPM-12S is

27 ft bgs; the depths of SVPM-2002-D, SVPM-2004-D, and SVPM-2007-D are 50 ft bgs; and the depth of SVPM-12 is 52 ft bgs. Each SVPM is equipped with a sealed cap, valve, and threaded sample port.

1.7.4 Soil Vapor Treatment

The soil vapor treatment system is housed within Building 03-35 and consists of a moisture separator, two soil vapor extraction blowers, and an interim vapor-phase granular activated carbon (VGAC) unit for removal of chlorinated VOCs from the off-gas. Soil vapor that enters the Treatment Building will first pass through the moisture separator tank (M-1) where any condensate will be separated and removed by a portable pump into 55-gallon drums on a periodic basis, tested, and disposed of off-site. The vapor from M-1 will be sucked through an air filter (F-2) by any one of two soil vapor extraction blowers (B-1A or B-1B) and then be treated in the VGAC unit (VGAC-1). If necessary, there is also a provision for adding make-up air via air filter-silencer (F-1) to the vapor stream after it leaves tank M-1, prior to air filter F-2. Under normal operation, only one blower will operate and the second one will be on standby. Under special circumstances, both blowers can operate simultaneously in parallel to accommodate higher flow rates. The treated vapor will be discharged from VGAC-1 via an exhaust stack. The SVECS will have a control panel (LCP) for local operation. The LCP will comprise of mechanical interlocks and relays and no Programmable Logic Controllers (PLCs) will be used.

The moisture separator tank, M-1 is a 1,000 gallon, 5 ft diameter x 4 ft high side shell carbon steel tank with a corrosion resistant coating and visual sight glass supplied by Tetrasolv Filtration. It has an integral vacuum relief valve and is equipped with a high condensate level sensor/switch.

The air filter-silencer F-1 is a Universal Silencer Model CS-4 flanged unit rated for 500 cfm and has a built-in silencing section equipped with a removable top plate for easy access to the filter element. Inline air filter F-2 is a Universal Silencer Model ILFV-8 rated for 2,200 cfm equipped with a removable top plate for easy access to the filter element. Filter F-2 is also equipped with a differential pressure gauge on the inlet and outlet of the filter (DPI-101) which provides a convenient and accurate means of monitoring the pressure drop across the filter as more and more dirt accumulates on the filter element.

The VGAC unit is a 6 ft wide x 8 ft long x 6.67 ft high carbon steel rectangular tank, Tetrasolv Filtration Model VF-5000, containing 5,000 lbs of vapor-phase granular activated carbon. It is designed to operate at a nominal flow rate of 600 cfm with a corresponding pressure drop of 3 i.w. and a maximum flow rate of 1,000 cfm with a corresponding pressure drop of 5 i.w.

Blowers B-1A and B-1B are National Turbine Corporation's Millennium Series Model M24-319R equipped with a three phase induction motor – squirrel cage rotor that is rated for 7.5 HP, 3,485 rpm, 460 volts. These blowers are designed for a nominal flow rate of 600 cfm each at 40 i.w. Each blower will have manual start and stop buttons, and reset switches for interlock shutdown scenarios. The treatment system will have the following interlock shutdown scenarios:

- Low vacuum switch in piping before the soil vapor extraction blowers;
- High level switch for condensate collected in the Moisture Separator;
- High temperature switch in the piping after the soil vapor extraction blowers; and, a
- High pressure switch in the piping after the soil vapor extraction blowers.

In shutdown scenarios, the LCP will signal the existing Auto-Dialer in an adjacent building.

1.7.5 Instrumentation Description

The components of the soil vapor treatment system will be manually controlled and monitored by appropriate instrumentation. Each of the main components – the moisture separator, the air filters, and the VGAC unit will be equipped with local vacuum/pressure gauges and/or differential pressure indicators. Additional instrumentation includes a high level switch for the moisture separator, and a low vacuum switch, high temperature switch and a high pressure switch for the soil vapor extraction blowers that will shut down the system and activate the Auto-Dialer.

The off-gas from the SVECS will be monitored for chlorinated VOCs as identified in the Division of Air Resources (DAR) permit equivalent effluent limitations and monitoring requirements. The samples will be analyzed by an analytical laboratory for tetrachloroethene, 1,1,1-trichloroethane, and trichloroethene.

1.8 Site Security

The SVECS Treatment Building and the equipment inside are surrounded by the NWIRP property fence with locked gates to protect it from burglary and vandalism and to protect the public and property from the equipment and operations. The SVECS is also equipped with a Honeywell Gamewell Flex Series Model GF505 commercial fire alarm panel and a Honeywell Ademco Vista Series security alarm control panel. In the event of a break-in, this alarm will activate the Auto Dialer and notify the security agency. The security agency will notify the Nassau County Police Department (NCPD) and the on-call Operator. After the Operator has inspected the SVECS property and determined the extent of the damage (if any), he will notify NCPD and the TtEC Project Manager. In the event of a fire at the SVECS, the local emergency services (including fire and police departments) will be automatically notified. The Operator will quickly initiate any necessary repairs to the SVECS and proceed to clean up any graffiti on the SVECS property caused by vandalism. All of these activities will be performed soon after seeking the necessary authorization from the TtEC Project Manager. Emergency telephone numbers are listed in Table 1-1.

1.9 Staffing and Training

1.9.1 Staffing

The SVECS has been designed to be operated on a long-term basis as an unmanned operation equipped with an Auto Dialer. It is anticipated that the Operator will monitor the SVECS operation at least once or twice a week. In the event of a plant shutdown, the Auto Dialer will dial an on-call Operator. The SVECS will be staffed by experienced Operators from TtEC.

During the first month of operation, there will be at least one Operator on duty at the SVECS, one shift per day, 3 days per week. For the next 5 months, the Operator will be present at the SVECS up to two days per week. After the first six months the operation will be unmanned with an on-call Operator. Emergency or back-up personnel will be available as required to support repair or complex maintenance activities. If necessary, technical support will be provided by specialty subcontractors for operational or equipment problems of a technical nature and additional operations support. A contracted maintenance crew or authorized equipment service representatives will perform repairs of mechanical/electrical equipment which are in excess of the Operator's capabilities.

Monitoring of the SVECS required by NYSDEC and the Navy will be carried out under the direction of registered Professional Engineers.

Table 1-1 Emergency Telephone Numbers

Site 1 Soil Vapor Extraction Containment System Emergency Telephone Numbers		
Contact	**Firm or Agency**	**Telephone Number**
Police	Nassau County Police Department	911 516-573-6800
Fire	Bethpage Fire Department	911 516-931-2660
Hospital	New Island Hospital 4295 Hempstead Turnpike Bethpage, New York 11714	516-579-6000
Ambulance		911
Non-emergency Medical Clinic – approved by Work Care	Island Occupational Medical 4 Dorothy Gate Massapequa, New York	516-795-5544
Stavros Patselas, PM TtEC 1st Contact	TtEC	Office - 215-702-4099 Cell - 267-688-9967
Brad Baillargeon, Primary Operator TtEC 2nd Contact	TtEC	Cell - 516-732-3393
SVECS Hotline	TtEC	516-732-3393
PESM - Grey Coppi	TtEC	Office - 973-630-8101 Cell - 215-327-0751
Navy RPM- Lora Fly	NAVY MIDLANT	757-444-0781
Chris Shukis, Mechanical / Electrical Supervisory Engineer Greg Pearman, ROICC	Navy PWD FEAD	Office - 860-694-4556 Cell - 860-235-2041 Cell - 860-235-2040
NWIRP Bethpage Facility Manager – Al Taormina	ECOR Solutions, Inc.	Office - 516-346-0344 Cell - 516-702-5861
Work Care	Anaheim, California	800-455-6155
Poison Control Center		800-222-1222
National Response Center		800-424-8802

1.9.2 Training

The Operator will be required to participate in a field training program given by TtEC and/or selected equipment manufacturer representatives. The training will address equipment operation, maintenance, equipment, safety requirements and troubleshooting and other subjects required to properly operate the SVECS including regular communication with the Site management.

1.10 Supporting Documentation

The following supporting documents and manual have been used as technical references for this Operations and Maintenance Manual. A copy of these documents can be found in the Treatment Building.

1. *Final Work Plan for the Design, Installation and Operation of Soil Vapor Extraction System, Site 1, Former Drum Marshalling Area at NWIRP Bethpage, NY, October 15, 2009,* by TtEC

2. *Final Construction Quality Control Plan for the Design, Installation and Operation of Soil Vapor Extraction System, Site 1, Former Drum Marshalling Area at NWIRP Bethpage, NY, September 24, 2009,* by TtEC
3. *Final Accident Prevention Plan for the Design, Installation and Operation of Soil Vapor Extraction System, Site 1, Former Drum Marshalling Area at NWIRP Bethpage, NY, September 8, 2009,* by TtEC
4. *O&M Manuals, Appendix D* (Manufacturers' Operation & Maintenance Manuals)

2.0 REGULATORY COMPLIANCE

This section of the Operation and Maintenance Plan identifies the Federal, State and local regulations that are applicable to the operation of the SVECS. The applicable regulations have been summarized relative to the following activities:

- Discharge of Treated Off-gas
- Waste Storage, Transportation and Disposal (spent vapor-phase granular activated carbon, spent air filters, personal protective equipment [PPE])

The specific regulations are identified below. The agency names, addresses and telephone numbers are provided for reference.

2.1 Discharge of Treated Off-Gas

The Clean Air Act (CAA) is a comprehensive federal law that regulates air emissions from stationary and mobile sources. Among other things, this law authorizes USEPA to establish National Ambient Air Quality Standards (NAAQS) to protect public health and public welfare and to regulate emissions of hazardous air pollutants. Section 112 of the Clean Air Act addresses emissions of hazardous air pollutants. After the issuance of the CAA, New York State enacted amendments to Environmental Conservation Law Articles 19 (Air Pollution Control) and 70 (Uniform Procedures), and DEC amended regulations 6NYCRR Parts 200 (General Provisions), 201 (Permits and Certificates), 621 (Uniform Procedures) and 231 (New Source Review in Non-Attainment Areas and Ozone Transport Regions).

With this demonstration of authority, DEC received delegation of the Title V operating permit program from the USEPA. Chapter III of the New York Code of Regulations and Rules, Subpart 201-5 regulates State Facility Permits. In New York, air permits are issued by the NYSDEC Division of Environmental Permits, with federal oversight from the USEPA. NYSDEC is responsible for the issuance, reissuance, modification, and enforcement of all air permits issued for discharges into the air of New York. Air emissions from the Bethpage Site 1 Soil Vapor Treatment Building are subject to this subpart.

2.1.1 Air Emissions Criteria and Monitoring Requirements

The allowable air emissions from the stack of the vapor-phase granular activated carbon adsorption unit are identified below. Monthly grab samples will be collected from the vapor phase treatment system influent and effluent as shown in Section 4.3. The samples will be analyzed for VOCs to monitor compliance with air effluent limits shown in Table 2-1. The location of the SVEWs and SVPMs are shown on Figure 2-1.

Table 2-1
Air Effluent Limitations

Contaminant	Discharge Limit (lb/hr)	Discharge Limit (lbs/year)
Trichloroethylene	0.07	590.6
Tetrachloroethylene	0.0009	7.9
1,1,1-Trichloroethane	0.13	1,181

Agency Contacts Information:

- SPDES and Air Emissions Requirements

New York Department of Environmental Conservation
Mr. Steven Scharf, P.E.
Division of Environmental Remediation
Remedial Action, Bureau A
625 Broadway
Albany, NY 12233-7015
(518) 402-9620

2.2 Waste Storage, Transportation and Disposal

Wastes generated due to SVECS operations will be handled in accordance with Section 7 of the Final Work Plan (TtEC, October 15, 2009). Storage of waste on-site will consist of spent vapor-phase granular activated carbon, spent air filters, condensate in 55-gallon drums and used personal protective equipment (PPE). These waste streams will be appropriately characterized (profiled) prior to disposal, as described in Sections 4 and 10 of this O&M Plan. It is anticipated that the wastes generated will be non-hazardous. The wastes will be manifested as either non-hazardous or hazardous waste depending on the waste profile, for offsite transportation and appropriate disposal. It is planned that non-hazardous wastes will be transported via trucks and disposed of at a NYSDEC approved RCRA Subtitle D solid waste landfill. Wastes will be shipped using a Bill of Lading or non-hazardous waste manifest.

When necessary, carbon change-out can be conducted using dry carbon delivered in 1,100-pound super sacks.

Agency Contacts Information:

- 49 CFR 100-180 - Transportation

U.S. Department of Transportation
Pipeline and Hazardous Materials Safety Administration
Central Region Office
2300 East Devon Avenue, Suite 478
Des Plaines, IL 60018
(847) 294-8580

NOTES:

1. FOR WELL DETAILS SEE DRAWING C-5.
2. A TOTAL OF TWELVE SVE WELLS SHALL BE USED FOR VAPOR EXTRACTION. SVE-101I AND SVE-101D ARE EXISTING AND OTHERS SHALL BE INSTALLED DURING CONSTRUCTION PHASE. THE SVE WELLS SHALL BE SCREENED AT INTERMEDIATE DEPTHS (25-30 FT) AND DEEP DEPTHS (40-60 FT). SEE DETAIL NOS. 4 AND 5 ON DRAWING NO. C-5 FOR SVE WELL DETAILS.
3. A TOTAL OF NINE SOIL VAPOR PRESSURE MONITORS SHALL BE USED TO MEASURE TREATMENT SYSTEM VACUUMS. SVPM-2004I AND SVPM-2004D SHALL BE INSTALLED DURING CONSTRUCTION PHASE. SOIL VAPOR PRESSURE MONITORS SVPM-2002S, I & D, SVPM-2003S & I AND SVPM-2007I & D ARE EXISTING BUT MUST BE REDEVELOPED BY REMOVING FILLED SAND (NO. 2) AND INSTALLATION OF PERMANENT FLUSH MOUNT CASING. SEE DETAIL NOS. 6, 7 AND 8 ON DRAWING NO. C-5 FOR SVPM DETAILS.

LEGEND

- OFFSITE SOIL GAS SAMPLE LOCATION
- ONSITE SOIL GAS SAMPLE LOCATION
- SOIL VAPOR PRESSURE MONITORING POINT (SVPM)
- SVE CONTAINMENT WELL LOCATION
- FENCE LINE
- PROPERTY LINE
- PROPOSED SOIL VAPOR PRESSURE MONITORING POINT (SVPM)
- SOIL VAPOR EXTRACTION WELLS

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APPROVED DATE

DEPARTMENT OF THE NAVY
NAVAL FACILITIES ENGINEERING COMMAND
NAVAL FACILITIES ENGINEERING COMMAND, MID-ATLANTIC
NAVAL WEAPONS INDUSTRIAL RESERVE PLANT BETHPAGE, NEW YORK
SITE 1, FORMER DRUM MARSHALLING AREA
LOCATION OF SOIL VAPOR EXTRACTION WELLS AND SOIL VAPOR PRESSURE MONITORS
APPROVED DATE EFANE FOR COMMANDER, NAVFAC

SEAL AREA

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SIZE: D DIS. SH. NO. 2-1

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or

U.S.Department of Transportation
Pipeline and Hazardous Materials Safety Administration
East Building, 2nd floor
1200 New Jersey Avenue, SE
Washington, D.C. 20590
(202) 366-0656

or

DOT Hazardous Materials Information Center: (800) 467-4922

3.0 RECORDS MANAGEMENT

3.1 Introduction

A comprehensive Records Management Program is essential to the efficient operation of the SVECS. Information relative to: facility usage, equipment preventative maintenance, sampling analysis and monitoring, process control monitoring, chemical usage, personnel management, etc. must be collected by the Plant Operator and reported upon request to meet regulatory and client requirements. This Section briefly summarizes the recommended records management program for the SVECS at NWIRP Bethpage Site 1.

In accordance with the requirements of the client contract, a bound operation and maintenance log and an electronic log is to be maintained by the Operator on-site, to include all collected records and events as described in this Section.

3.2 Process Control Recording

Process control recording is to be completed by the Operator on a daily/weekly/monthly basis. It is divided into two categories: 1) process monitoring and 2) equipment operation monitoring via manual/visual inspections.

3.2.1 Process Monitoring

Process control data will be documented manually from the instrumentation by the Operator. The Operator will transfer selected process control data into a weekly/monthly report.

The process monitoring reports will include at a minimum the following information:

- Total daily/weekly flow and average daily/weekly flow rate of soil vapor to the VGAC unit from the SVEWs (from Operator records);
- Concentrations of VOCs in soil vapor entering the VGAC unit in accordance with the established sampling frequency (from laboratory analysis);
- Concentrations of VOCs in treated off-gas leaving the exhaust stack in accordance with the established sampling frequency (from laboratory analysis);
- Identification of the air filters in which spent filter elements were replaced, if any (from Operator records);
- Quantity of condensate pumped from moisture separator tank, if any (from Operator records);

- Flow rates of soil vapor from individual SVEWs as measured by portable velocity meter (from Operator records);
- Concentrations of total VOCs in individual SVEWs as measured by PID (from Operator records);
- Documentation of condensate cleanout (if any) from any ports along the conveyance pipeline from the Flow Monitoring Station to the Treatment Building (from Operator records);
- Daily/weekly recording of maintenance and repairs made to equipment, as applicable (from Operator records); and
- Daily/weekly recording of system shutdowns (from Operator records).

Based on experience gained in operating the SVECS, following the start-up and prove-out periods as discussed in Section 4.3.1, TtEC may reduce the frequency of sampling and analyses for the influent soil vapor and treated off-gas from the VGAC.

During 2010, the operation of the various subsystems of the SVECS will be monitored and the data collected will be utilized to conduct value engineering studies in order to determine how the SVECS process can be optimized and/or modified to improve the efficiency and reduce operating costs. Depending on the results of these studies, the operation of the SVECS may be modified for 2011 and later years.

3.2.2 Equipment Operation Monitoring

Reports will be generated to document regular equipment inspections and operational parameters. The following information will be documented on the "***Inspection Form***" located in ***Appendix A, Report Forms***:

- Visual inspection of all piping, fixtures, blowers and tanks to check for leaks or visible signs of wear;
- Visual inspection of condensate flow throughout the vapor collection system via designated sight tubes / cleanout ports within the system; and
- Visual inspection of security, heating and ventilation and fire protection systems.

Specific preventative maintenance on the equipment is described in ***Section 9.0, Equipment Maintenance*** of the Manual. Maintenance performed for each piece of equipment is to be recorded using the "***Equipment Maintenance Form***", located in ***Appendix A, Report Forms***.

3.3 Laboratory Data

Laboratory results from the SVECS process and waste sampling will be summarized in the quarterly status and monitoring reports to be prepared by TtEC.

3.4 Inventory Monitoring and Recording

It is recommended that the Operator monitor and record all equipment used during regular treatment system operations at least on a weekly basis and make an inventory. This includes process equipment, as well as, building maintenance supplies/equipment. This information is to be included in the Equipment Maintenance Form, found in ***Appendix A, Report Forms***. Reference is also made to the ***"Maintenance and Monitoring Equipment and Tool List"*** found in ***Appendix B, Maintenance and Monitoring Equipment and Tool List***, and the ***"Spare Parts Inventory"*** located in ***Appendix C, Spare Parts***.

3.5 Personnel Management

On-site personnel management is an important part of the efficient operation and maintenance of the SVECS. Location of on-site personnel is essential in order to meet site health and safety protocol.

Personnel management includes records of time on-site for the Operator, as well as, visitors and security personnel. Operators are to prepare daily logs for inclusion in weekly employer timesheets.

4.0 SAMPLING AND ANALYSIS PROGRAM DESCRIPTION

4.1 Purpose

The purpose of this sampling and analysis program (SAP) section is to describe data acquisition procedures, numbers and types of samples, methods of analysis, and quality control measures associated with data collection and analysis for the SVECS. The detailed definition of quality assurance (QA) and quality control (QC) for all sampling related project activities to be implemented at the Site is covered in a separate document, the Final Work Plan, which ensures the integrity of the work to be performed at the Site and ensures that the data collected will be of the appropriate type and quality needed for their intended use. This SAP is intended to be a procedural guide for all TtEC team personnel and subcontractors involved in sampling and analysis and data acquisition while implementing remedial actions for the Site 1 SVECS. Collection of condensate (aqueous) samples is described in Standard Operating Procedure 001 (SOP001), collection of soil vapor samples using Summa canisters is described in SOP002, and collection of soil vapor samples using Tedlar bags is described in SOP003 and these SOPs are also included in Appendix A of this O&M Plan.

4.2 Sampling and Analysis Data Objectives

This section gives an overview of sampling and analysis activities and their data objectives. Sampling and analysis activities for the SVECS consist of: 1) process monitoring and sampling; and, 2) monitoring and characterization of the effluent streams (condensate from the moisture separator tank, and spent media [VGAC, air filter elements] for waste disposal) from the SVECS.

4.2.1 Generalized Scope of Work

Process and soil vapor monitoring and sampling and effluent stream characterization activities for this project will include the following:

- Sampling and monitoring of influent, effluent, and intermediate process streams within the SVECS for the purpose of evaluating the operation and performance of the process equipment used for moisture separation and vapor-phase granular activated carbon adsorption during routine operations.
- Sampling and monitoring of the SVECS performance during the start-up period in 2009/2010 in order to ensure that the system is operating properly and that effluent streams meet all regulatory and disposal facility requirements.
- Sampling and monitoring of the SVECS during the prove-out period in 2010 in order to ensure that the system is operating in accordance with the design specifications and meets all regulatory and disposal facility requirements.
- Sampling and monitoring of the soil vapor to determine the effectiveness of the remediation activities and monitor the hydraulic containment and capture of the contaminated soil vapor by the intermediate and deep extraction wells.

Other activities include health and safety related air monitoring within the SVECS Treatment Building and the Flow Monitoring Station as well as sampling and analysis for waste characterization purposes. Air monitoring is discussed in detail in the APP and SHSP.

4.2.2 Data Quality Objectives

Data Quality Objectives (DQOs) are requirements needed to support decisions relative to the various site activities. Sampling procedures and analytical data collected must be of a quality that supports the decision making process and ensures that project objectives are achieved. The sampling and analysis program will ensure that data meet the requirements for precision, accuracy, representativeness, comparability, completeness, and sensitivity defined in the SAP. Project Quality Objectives and Systematic Planning Process Statements are defined in the Final Work Plan.

Samples will be analyzed in strict accordance with the analytical test methods and procedures utilizing approved USEPA and NYSDEC Analytical Services Protocol methods. Analytical methods will provide results with detection limits sufficiently below designated action levels, and the methods will be accurate enough to quantify contamination at concentrations below action levels. Sample collection will utilize approved techniques that will ensure that the sample is representative of current environmental and operational conditions. QA/QC samples will be collected and analyzed for the purpose of assessing the quality of the sampling effort and of the analytical data. A description and frequency of QA/QC samples to be collected is specified in Section 4.3.2.

Laboratories providing chemical measurements for the purposes of determining the effectiveness of the remediation must be certified by the State of New York's Environmental Laboratory Approval Program (ELAP) for aqueous and vapor media and the appropriate analytes and methods, and all laboratory methods must meet the reporting limit requirements acceptable to both the USEPA and NYSDEC. TtEC plans to send samples for a particular analytical parameter only to those laboratories that have been certified by the State of New York for that parameter. To the extent possible, TtEC plans to utilize local certified laboratories with the samples being delivered to the certified laboratory by a local courier service instead of shipping samples via an overnight delivery service to laboratories that are further away. Only if required during the project (e.g., the chosen laboratory loses its certification for the parameter, etc.) will additional laboratories be utilized for analysis of a particular parameter. The primary subcontract laboratories are Test America, Pittsburgh (through contract with Southern University and A & M College-CEES) and, Air Toxics, Ltd.

A Project Manager and QA Manager will be assigned by each laboratory to the project, and they will provide technical guidance to the project team, oversee laboratory requirements (including QA/QC requirements) for the project, review laboratory data for compliance with approved planning documents, maintain laboratory documentation, and coordinate corrective action procedures as necessary. The TtEC QA/QC Manager, in concert with the TtEC Database Management Specialist, will coordinate with the laboratories on the number and type of analytical samples necessary. The subcontractor laboratory(ies)

will be responsible for the delivery of sample containers (pre-preserved as necessary) to the Site, and subsequent pick-up/shipment and analysis of collected samples. Data packages will be submitted by the subcontractor laboratories directly to the TtEC Team.

4.3 Sampling Program Procedures and Requirements

This section discusses and summarizes the sampling and monitoring activities described in the Scope of Work and summarized in Section 4.2.1, and identifies chemical and physical sampling requirements for this program.

4.3.1 Sampling and Monitoring Programs

Several sampling and monitoring programs will be conducted as part of the SVECS operations. These include:

1) sampling and monitoring of influent, effluent, and intermediate process streams for routine operations;
2) sampling and monitoring of influent, effluent, and intermediate process streams during the start-up period; and,
3) sampling and monitoring of influent, effluent, and intermediate process streams during the prove-out period.

These sampling and monitoring programs are described below. Specific sampling protocols are identified below. QA/QC samples will be collected as identified in Section 4.3.2. All procedures for decontamination of equipment, identification, labeling, chain-of-custody, packing, and transportation will be followed as identified in Section 4.3.3 and 4.3.4.

4.3.1.1 Sampling and Monitoring for Routine Operations

In order to keep the SVECS running as designed, the SVECS Operator will have to communicate regularly with the SVECS Project Manager and the SVECS Design Engineer. The communication with the SVECS Project Manager and/or the SVECS Design Engineer is necessary so that if changed soil vapor quality or other such conditions are encountered, flow rates and set points can be adjusted as required (if necessary).

Routine operations will commence at the end of the prove-out period (i.e., after the end of the first six months of operations). During routine operations, the following process streams will be sampled and/or monitored (see Table 4-1). It should be noted that most of this sampling and monitoring is for the purpose of tracking and documenting the performance of plant operations and not for regulatory compliance reporting purposes. Only the process effluent streams will be sampled for regulatory compliance purposes for the parameters identified by NYSDEC, and the disposal facilities at the designated frequency. Based on experience gained in operating the SVECS, following the start-up and prove-out periods as discussed below, TtEC may reduce the frequency of sampling and analyses for the influent soil vapor and some of the intermediate process streams. **All analytical parameters for regulatory compliance will be collected monthly and analyzed at a laboratory certified by the State of New York for these parameters.**

Table 4-1 Sampling and Monitoring for Routine Operations

Process Stream	Sampling/Monitoring Location	Analytical Parameters	Required for Regulatory Compliance
Influent from SVE-101I	Sample port in Flow Monitoring Station	Total VOCs with PID and Tedlar bags	No
Influent from SVE-101D	Sample port in Flow Monitoring Station	Total VOCs with PID and Tedlar bags	No
Influent from SVE-102I	Sample port in Flow Monitoring Station	Total VOCs with PID and Tedlar bags	No
Influent from SVE-102D	Sample port in Flow Monitoring Station	Total VOCs with PID and Tedlar bags	No
Influent from SVE-103I	Sample port in Flow Monitoring Station	Total VOCs with PID and Tedlar bags	No
Influent from SVE-103D	Sample port in Flow Monitoring Station	Total VOCs with PID and Tedlar bags	No
Influent from SVE-104I	Sample port in Flow Monitoring Station	Total VOCs with PID and Tedlar bags	No
Influent from SVE-104D	Sample port in Flow Monitoring Station	Total VOCs with PID and Tedlar bags	No
Influent from SVE-105I	Sample port in Flow Monitoring Station	Total VOCs with PID and Tedlar bags	No
Influent from SVE-105D	Sample port in Flow Monitoring Station	Total VOCs with PID and Tedlar bags	No
Influent from SVE-106I	Sample port in Flow Monitoring Station	Total VOCs with PID and Tedlar bags	No
Influent from SVE-106D	Sample port in Flow Monitoring Station	Total VOCs with PID and Tedlar bags	No
Influent to VGAC-1	Sample port (BV-108)	Chlorinated VOCs with Summa Canisters	Yes
Effluent from VGAC-1 to Exhaust Stack	Sample port (BV-109)	Chlorinated VOCs with Summa Canisters	Yes
Condensate from Moisture Separator	55-gallon drum	TCLP VOCs, TCLP SVOCs, TCLP metals, PCBs, TOX	Yes
Spent /filter / adsorber media	Composite sample	TCLP VOCs, TCLP SVOCs, TCLP metals, PCBs, TOX	Yes

Collection of condensate (aqueous) samples is described in SOP001, collection of soil vapor samples using Summa canisters is described in SOP002, and collection of soil vapor samples using Tedlar bags is described in SOP003 and these SOPs are also included in Appendix A of this O&M Plan.

4.3.1.2 Sampling and Monitoring SVECS Performance during Start-up Period

Sampling and monitoring of the SVECS performance will be implemented during the start-up period in 2009/2010 in order to ensure that the system is operating properly and that effluent streams meet all regulatory, and disposal facility requirements. The start-up period is defined as the first 15 days of operations. In order to keep the plant running as designed, the SVECS Operator will have to communicate regularly with the SVECS Project Manager and the SVECS Design Engineer. The

communication with the SVECS Project Manager and/or the SVECS Design Engineer is necessary so that if changed soil vapor quality or other such conditions are encountered, flow rates and set points can be adjusted as required (if necessary).

During the start-up period, the following process streams will be sampled and/or monitored (see Table 4-2). The purpose of this sampling and monitoring is for tracking and documenting SVECS operations performance as well as for regulatory compliance. **During the system start-up period, one round of soil vapor samples from the 12 SVEWs and the influent and effluent from the VGAC unit will be collected using Summa canisters.** Only the process effluent streams will be sampled for regulatory compliance purposes for the parameters identified by NYSDEC, and the disposal facilities at the designated frequency. All analytical parameters for regulatory compliance will be collected weekly and analyzed at a laboratory certified by the State of New York for these parameters.

Table 4-2 Sampling and Monitoring during the Start-up Period

Process Stream	Sampling/Monitoring Location	Analytical Parameters	Required for Regulatory Compliance
Influent from SVE-101I	Sample port in Flow Monitoring Station	Chlorinated VOCs with Summa Canisters	No
Influent from SVE-101D	Sample port in Flow Monitoring Station	Chlorinated VOCs with Summa Canisters	No
Influent from SVE-102I	Sample port in Flow Monitoring Station	Chlorinated VOCs with Summa Canisters	No
Influent from SVE-102D	Sample port in Flow Monitoring Station	Chlorinated VOCs with Summa Canisters	No
Influent from SVE-103I	Sample port in Flow Monitoring Station	Chlorinated VOCs with Summa Canisters	No
Influent from SVE-103D	Sample port in Flow Monitoring Station	Chlorinated VOCs with Summa Canisters	No
Influent from SVE-104I	Sample port in Flow Monitoring Station	Chlorinated VOCs with Summa Canisters	No
Influent from SVE-104D	Sample port in Flow Monitoring Station	Chlorinated VOCs with Summa Canisters	No
Influent from SVE-105I	Sample port in Flow Monitoring Station	Chlorinated VOCs with Summa Canisters	No
Influent from SVE-105D	Sample port in Flow Monitoring Station	Chlorinated VOCs with Summa Canisters	No
Influent from SVE-106I	Sample port in Flow Monitoring Station	Chlorinated VOCs with Summa Canisters	No
Influent from SVE-106D	Sample port in Flow Monitoring Station	Chlorinated VOCs with Summa Canisters	No
Influent to VGAC-1	Sample port (BV-108)	Chlorinated VOCs with Summa Canisters	Yes
Effluent from VGAC-1 to Exhaust Stack	Sample port (BV-109)	Chlorinated VOCs with Summa Canisters	Yes
Condensate from Moisture Separator	55-gallon drum	TCLP VOCs, TCLP SVOCs, TCLP metals, PCBs, TOX	Yes

Process Stream	Sampling/Monitoring Location	Analytical Parameters	Required for Regulatory Compliance
Spent /filter / adsorber media	Composite sample	TCLP VOCs, TCLP SVOCs, TCLP metals, PCBs, TOX	Yes

Collection of condensate (aqueous) samples is described in SOP001, collection of soil vapor samples using Summa canisters is described in SOP002, and collection of soil vapor samples using Tedlar bags is described in SOP003 and these SOPs are also included in Appendix A of this O&M Plan.

4.3.1.3 Sampling and Monitoring SVECS Performance during Prove-Out Period

Sampling and monitoring of the SVECS performance will be implemented during the prove-out period in 2010 in order to ensure that the SVECS is operating in accordance with the design specifications and that effluent streams meet all regulatory, and disposal facility requirements. The prove-out period is defined as the first through the sixth months of operations after the start-up period is completed. In order to keep the plant running as designed, the SVECS Operator will have to communicate regularly with the SVECS Project Manager and the SVECS Design Engineer. The communication with the SVECS Project Manager and/or the SVECS Design Engineer is necessary so that if changed soil vapor quality or other such conditions are encountered, flow rates and set points can be adjusted as required (if necessary).

During the prove-out period, the following process streams will be sampled and/or monitored (see Table 4-3). The purpose of this sampling and monitoring is for ensuring that the SVECS is operating in accordance with the design specifications and that effluent streams meet all regulatory, and disposal facility requirements. **During the system prove-out period, all samples will be collected on a monthly basis. At the end of the third and sixth months, soil vapor samples from the 12 SVEWs will be collected using Summa Canisters instead of using Tedlar Bags and a PID.** Based on the data that is collected during the start-up and prove-out periods, TtEC may decide to reduce the frequency of sampling and analyses for the influent soil vapor and some of the intermediate process streams. Only the process effluent streams will be sampled for regulatory compliance purposes for the parameters identified by NYSDEC, and the disposal facilities at the designated frequency. All analytical parameters for regulatory compliance will be collected monthly and analyzed at a laboratory certified by the State of New York for these parameters.

Table 4-3 Sampling and Monitoring during the Prove-out Period

Process Stream	Sampling/Monitoring Location	Analytical Parameters	Required for Regulatory Compliance
Influent from SVE-101I	Sample port in Flow Monitoring Station	Total VOCs with PID and Tedlar bags	No
Influent from SVE-101D	Sample port in Flow Monitoring Station	Total VOCs with PID and Tedlar bags	No
Influent from SVE-102I	Sample port in Flow Monitoring Station	Total VOCs with PID and Tedlar bags	No
Influent from SVE-102D	Sample port in Flow Monitoring Station	Total VOCs with PID and Tedlar bags	No

Process Stream	Sampling/Monitoring Location	Analytical Parameters	Required for Regulatory Compliance
Influent from SVE-103I	Sample port in Flow Monitoring Station	Total VOCs with PID and Tedlar bags	No
Influent from SVE-103D	Sample port in Flow Monitoring Station	Total VOCs with PID and Tedlar bags	No
Influent from SVE-104I	Sample port in Flow Monitoring Station	Total VOCs with PID and Tedlar bags	No
Influent from SVE-104D	Sample port in Flow Monitoring Station	Total VOCs with PID and Tedlar bags	No
Influent from SVE-105I	Sample port in Flow Monitoring Station	Total VOCs with PID and Tedlar bags	No
Influent from SVE-105D	Sample port in Flow Monitoring Station	Total VOCs with PID and Tedlar bags	No
Influent from SVE-106I	Sample port in Flow Monitoring Station	Total VOCs with PID and Tedlar bags	No
Influent from SVE-106D	Sample port in Flow Monitoring Station	Total VOCs with PID and Tedlar bags	No
Influent to VGAC-1	Sample port (BV-108)	Chlorinated VOCs with Summa Canisters	Yes
Effluent from VGAC-1 to Exhaust Stack	Sample port (BV-109)	Chlorinated VOCs with Summa Canisters	Yes
Condensate from Moisture Separator	55-gallon drum	TCLP VOCs, TCLP SVOCs, TCLP metals, PCBs, TOX	Yes
Spent /filter / adsorber media	Composite sample	TCLP VOCs, TCLP SVOCs, TCLP metals, PCBs, TOX	Yes

Collection of condensate (aqueous) samples is described in SOP001, collection of soil vapor samples using Summa canisters is described in SOP002, and collection of soil vapor samples using Tedlar bags is described in SOP003 and these SOPs are also included in Appendix A of this O&M Plan.

4.3.2 Quality Control Sample Requirements

QC samples are analyzed for the purpose of assessing the quality of the sampling effort and of the analytical data. QC samples include field QC samples and laboratory QC samples. Field QC samples are described in the SAP and include environmental field duplicate samples, trip blanks, equipment rinsate blanks, and cooler temperature blanks. Laboratory QC samples include method blanks, matrix spike/matrix spike duplicates, surrogate compounds, internal standards, laboratory control samples, and laboratory duplicate samples. The general information and guidance regarding the different types of field QC samples is provided below.

4.3.2.1 Environmental Field Duplicate Samples

Field duplicates are used to monitor the precision of the field sampling procedures and the variability of sample data. Aqueous field duplicates are field split samples collected by mixing enough volume for two samples. Field duplicates will typically be collected and analyzed at a frequency of 1 for every 20 samples (approximately 5 percent). Field duplicates will only be collected for the soil vapor or

condensate samples that are analyzed for regulatory purposes. Field duplicates will be analyzed for the same parameters, as applicable, as the original samples.

4.3.2.2 Trip Blanks

A trip blank serves to detect possible cross-contamination of samples resulting from handling, storage and shipment procedures. Trip blanks consist of volatile organic analysis (VOA) vials filled with deionized (DI) water prior to initiation of daily field activities and preserved accordingly, which accompany the day's environmental samples through collection and shipment to the laboratory. In addition, trip blanks are stored by the laboratory under the same conditions as the environmental samples. A trip blank must accompany each cooler containing aqueous samples for VOC analysis, and will be analyzed identically to the associated environmental samples. All aqueous VOC samples will be consolidated in one cooler for daily shipment, as possible, to minimize the number of trip blanks required.

4.3.2.3 Equipment Rinsate Blanks

Equipment rinsate blanks are used to monitor cleanliness of the sampling equipment and the effectiveness of the decontamination procedures. Dedicated sampling equipment will be used during the project to the extent possible, reducing the need and frequency of equipment rinsate blanks. As required, equipment rinsate blanks will be collected once per week (assuming 5-day work week) and sent to the off-site laboratory for analysis of the same parameters (chemical only) as the original samples.

4.3.2.4 Cooler Temperature Blanks

Temperature blanks are used to monitor the receipt temperature of the samples upon arrival at the analytical laboratory. Temperature blanks will consist of an unpreserved 40-milliliter glass or plastic vial filled with tap water. A temperature blank must be included in each sample container sent to an analytical laboratory. However, New York regulations include provisions for omitting sample receipt temperature at the laboratory if the samples are received on ice.

4.3.3 Equipment Decontamination Procedures

For this sampling and analysis program, both disposable and non-disposable sampling equipment may be used. All non-disposable sampling equipment will be decontaminated prior to collecting each sample. The following sequence will be used:

- Remove all visible contaminants using laboratory detergent and potable water.
- Rinse with potable water.
- Rinse with deionized water.
- Rinse organic sampling equipment with methanol. For inorganic sampling equipment, rinse with 9.9% nitric acid in water. Then rinse with deionized water again.

Decontamination fluids generated will be collected and stored on site for later disposal as specified in the Final Work Plan (TtEC, October 15, 2009).

4.3.4 Sample Identification, Documentation, Chain of Custody, Packaging, and Shipping

Identification, documentation and strict custody of samples are important for ensuring the integrity of the environmental samples and maintaining data quality. The subsections below address sample identification, packaging, shipping, and documentation.

4.3.4.1 Sample Identification and Labeling

Samples collected from the SVECS will be uniquely identified. Each sample will be denoted with an identification code as to the process stream (i.e., the location of sampling and type of material being sampled). These codes are outlined in the table below. The date of the sampling (e.g., "011609") will then be added to the identification to segregate different process sampling events. If required, further differentiation may be added (such as "01" and "02" if sampled twice during the same day).

Process Stream	**Location/Material Code**
Condensate from Moisture Separator Tank	CD
Influent vapor to VGAC-1	IN
Treated off-gas from VGAC-1 to Exhaust Stack	EF
Influent from Soil Vapor Extraction Well	Use well ID

For example, the treated off-gas sample collected on July 14, 2009 would be denoted as "EF-071409." If two samples of the condensate were obtained on August 17, 2009, then the first sample would be "CD-081709-01" and the second would be "CD-081709-02."

Sample labels will be completed by field personnel. Labels will include the project identification, sample identification, date and time of sampling, sampler, analyses to be performed on the specific sample container, type of sample (grab or composite) and preservative (if applicable). Each sample label will be filled out completely with indelible ink.

4.3.4.2 Sample Documentation

The sampling team or any individual performing a particular field investigation activity will be required to maintain a field logbook. Each logbook will be controlled and assigned a unique sequential identification by the Field Team Lead (e.g., the second logbook devoted to the SVECS sampling activities may be designated "SVECS Sampling Logbook No. 2"). In addition, a list of field logbooks will be maintained by the Field Team Lead, and will include the name of the logbook, purpose, person to whom assigned (i.e., name of task lead), date assigned, and date returned to the Field Team Lead.

The field logbook will be a bound weatherproof notebook, and entries to the logbook must be filled out legibly in black waterproof ink. Pertinent information to be recorded in field logbooks includes all information that is necessary to reconstruct the sampling operations. Documentation of sample activities in the field logbook will be completed immediately after sampling at the location of sample collection. Logbook entries will contain all sample information, including sample number, collection time, location, descriptions, field measurements, and other site- or sample-specific observations. Any additional information, such as generated instrument output, will be attached into the field logbook with clear tape in the order of generation or will be filed in a specific folder for inclusion with project files.

Logbook pages (for both the master site logbook and the field logbooks) will have the name of the Site and a description of the location/activity discussed, as well as the calendar date, written on the top of each page. Logbook pages will be consecutively numbered, and upon entry of data, the logbook pages require the date and the signature of the responsible project team member at the bottom of each page. Corrections

to the logbooks will consist of a single strike line through the incorrect entry, the new accurate information, the initials of the corrector, and the date of amendment. Any blank spaces/pages in the logbooks will be crossed out with a single strike mark and signed by the person making the notation.

4.3.4.3 Sample Chain of Custody

Sample custody must be strictly maintained and carefully documented each time the sample material is collected, transported, received, prepared, and analyzed. Custody procedures are necessary to ensure the integrity of the samples, and samples collected during the field investigation must be traceable from the time the samples are collected until they are disposed of and/or stored, and their derived data are used in the final report.

A sample is considered under custody if it is/was:

- In a sampler's possession;
- In a sampler's view after being in his/her possession;
- In a sampler's possession and locked up in a secured container; or
- In a designated secure area.

Personnel collecting samples are responsible for the care and integrity of those samples until they are properly transferred or dispatched. Therefore, the number of people handling a sample will be kept to a minimum.

Chain of Custody (COC) records will be completed by the sampler and shall accompany the samples at all times. The following information shall be indicated on the COC record:

- Project identification;
- Signature of samplers;
- Sample identification, sample matrix, date and time of collection, grab or composite sample designation, number of containers corresponding to that sample identification, analyses required, remarks or sample location (if applicable), and preservation method(s);
- Signature of the individual relinquishing the samples; and
- Name of the individual(s) receiving the samples and air bill number, if applicable.

The COC preparer will then check the sample label and COC record for accuracy and completeness.

4.3.4.4 Sample Tracking

When transferring custody of samples, individuals relinquishing custody and individuals receiving custody will sign, date, and record the time on the COC. When samples are being shipped to the laboratory via courier, the COC record will be signed as “receiver” by the courier when he/she accepts possession of the samples, and a signed copy will be retained by the TtEC Team. For samples transported by an overnight shipping company (e.g.,Federal Express), the shipping company will be indicated as receiving custody. Upon receipt of shipment at the laboratory, a designated sample custodian will accept custody of the samples and verify that information on the sample labels matches the COC record. Pertinent information on shipment, air bill number, pickup, courier, date, and time will be recorded on the COC. It is then the laboratory's responsibility to maintain logbooks and custody records throughout sample preparation and analysis.

4.3.4.5 Sample Packaging and Shipping

Samples for off-site laboratory analysis will be shipped via Federal Express or by courier for overnight delivery in waterproof coolers using the procedures outlined below. The samples taken for this project shall be considered low-level or environmental samples for packaging and shipping purposes. Prior to packing and shipping, as applicable, samples will be stored on ice. The sample packing procedures are as follows:

- After filling out the pertinent information on the sample label, if necessary cover the label with clear tape.
- Place about 3 inches of inert cushioning material, such as bubble wrap, in the bottom of the cooler.
- Place containers upright in the cooler in such a way that they will not touch during shipment.
- Put in additional inert packing material to partially cover the sample containers (more than halfway).
- Place ice, when necessary, sealed in plastic bags, around and on top of the containers. As applicable to specific analyses, the temperature of the samples shall be maintained at or below 4 °C during shipment to the laboratory. The addition of ice will not be necessary for those parameters that do not require cooling as a preservation technique
- Fill cooler with cushioning material.
- Tape the drain on the cooler shut.

If the samples are sent directly via courier service from the Site to a local laboratory certified by the State of New York, the COC record will not be placed inside the cooler. The sample cooler(s) will be secured, with signed and dated custody seals affixed over the lid opening in at least two locations, and the cooler wrapped with strapping tape (without obscuring the custody seals). Orientation "this end up" arrows will be drawn or attached on two sides of the cooler. The COC record will be signed by the receiver (e.g., the courier, the laboratory sample custodian) when he/she accepts possession of the samples, and a signed copy will be retained by the TtEC Team.

For samples being shipped by an overnight delivery service to a laboratory certified by the State ofNew York, the COC record will be placed in a waterproof plastic bag and taped with masking tape to the inside lid of the cooler. The cooler lid will be secured with strapping/shipping tape (wrap the cooler completely with tape at a minimum of two locations), and a completed shipping label will be attached to the top of the cooler. Orientation "this end up" arrows will be drawn or attached on two sides of the cooler. Two signed and dated custody seals will be placed on opposite corners of the cooler so that the cooler cannot be opened without breaking the seals.

4.4 Laboratory Analytical Procedures and Requirements

4.4.1 Analytical Procedures

As stated previously, samples will be analyzed in strict accordance with the analytical test methods and procedures utilizing approved USEPA and NYSDEC Analytical Services Protocol methods. The anticipated number of samples, analytical methods, and number of QC samples are identified in Section 4.3.1.

Analytical methods selected for the Site will provide results with detection limits sufficiently below designated action levels, and the methods will be accurate enough to quantify contamination at concentrations below action levels.

4.4.2 Laboratory Reporting Requirements

Laboratory reports will include a full data package in order to support QA/QC review. Reporting requirements will include, but are not limited to the following:

- The name, address, and phone number of the analytical laboratory.
- Signature of an authorized laboratory individual, indicating the acceptability of the data.
- A copy of signed chain of custody forms, indicating the condition of samples at the time of receipt by the laboratory.
- Air sampling results will be reported in units of ug/m^3 whereas waste characterization (TCLP) and condensate sampling results will be reported in units of mg/liter. Results will be reported on a dry weight basis and will include correction for dilution/concentration factors.
- Sample results will include a summary of pertinent chain of custody and tracking information (i.e., dates of preparation and analysis, analytical instrumentation, calibration information, associated QC samples, etc.). Other raw data including chromatograms must be on file at the laboratory and available for review upon request.
- Quality control results reported are to include spiking concentrations and acceptable limits. QC results that exceeded criteria and corrective actions should be discussed by the laboratory.

4.4.3 Data Review

All data will be reviewed by laboratory QC personnel prior to submittal to TtEC. In addition, the TtEC chemistry staff will perform a review of QA/QC data for all sample analysis results. After these reviews, the data will be provided to the TtEC personnel who are responsible for monitoring the performance of the SVECS operation. They will utilize the analytical results to verify that the plant is operating in the normal expected range of operation for each variable reported.

The review will include the following:

- Review of chain-of-custody and sample receipt documents to verify sample identities.
- Review of sample log-in documents to verify any potential problems with sample custody, integrity, preservation, labeling, etc.
- Review of field blank data to ascertain any problems with container or preservative contamination, or field contamination.
- Review of method blank data to determine the presence and approximate concentration of sources of contamination in the analytical process.
- Review of matrix spike data as a measure of matrix effects and analytical precision.
- Review of field and laboratory duplicate data as a measure of sampling technique applicability, homogeneity, and analytical precision.
- Review of standard reference material or laboratory control sample data as a measure of analytical accuracy. Data will be compared to the certified acceptable ranges of analytical values.
- Review of sample dates, extraction/digestion dates, and analysis dates to determine whether maximum holding times were met or exceeded.

Where appropriate, data qualifiers will be incorporated into certain data summary tables generated for this project. A brief summary of the data QA/QC review will be included in the final report.

4.5 Exit Strategy

As stated in Section 1.6, the remedial objective for this SVECS is to prevent further off-site migration of VOC contaminated soil vapor and to the extent practical, capture contaminated soil vapor with a TCE concentration greater than 250 ug/m^3. A secondary objective of this project is to address soil vapor with a TCE concentration greater than 5 ug/m^3. The treatment system has been designed for a 4 year operational life.

The final determination to take the SVECS off-line and to decommission and dismantle the SVECS and associated wells will be made by the Navy in consultation with NYSDEC. When under non-operating winter conditions, after the SVECS has been shut-down for a period of at least one week and the on-site and off-site sub-slab and SVPM TCE concentrations are less than 5 ug/m^3, then TtEC will make the recommendation to the Navy that operations at the SVECS be terminated and that the SVECS building and all associated equipment and wells be decommissioned and dismantled.

5.0 HEALTH AND SAFETY

5.1 Introduction

All activities performed at the SVECS are governed by the Accident Prevention Plan (APP) and the Site-Specific Health and Safety Plan (SHSP) which is Appendix A of the APP. The SHSP presents procedures to be followed by TtEC and its subcontractors and all other on-site personnel in order to avoid and, if necessary, protect against health and/or safety hazards. The SHSP is designed to protect on-site personnel and area residents from physical, chemical, and all other hazards posed by construction, operation, maintenance, and monitoring activities conducted at the Site. The SHSP takes into account the hazards inherent to the planned activities. In addition, Section 12.0 of the SHSP includes the Emergency Response and Contingency Plan. The SHSP will comply with applicable parts of Occupational Safety and Health Administration (OSHA) Regulations, primarily 29 CFR Parts 1910 and 1926, and TtEC's Environmental Health and Safety (EHS) Program. Many programs from the EHS Program are referenced in the SHSP and are included in the appendices. Modifications to the SHSP may be made with the approval of the Project Environmental and Safety Manager (PESM) for this project using the Change Request Form found in Appendix A of the SHSP.

5.2 Summary of Major Risks

- Work near underground utilities.
- Heavy equipment hazards.
- Slips, Trips, and Falls.
- Exposure to chlorinated VOCs, PCBs, chromium, and cadmium .
- Rotating machinery
- Electrical hazards
- Excavation and Trenching
- Handling of chemicals
- Handling of motor oils and greases for blower motors

5.3 Zero Incident Performance

Zero Incident Performance (ZIP) describes TtEC's approach and expectations for both safety and project execution. TtEC will achieve this level of performance excellence through teamwork and partnering with our client and our Subcontractors, and through the participation of every person on this project.

We (TtEC and our client) believe that:

- All incidents are preventable through proper planning, tasking, and execution of plans as written.
- Any goal besides *Zero Incident Performance* is unacceptable and sends the message that incidents cannot be prevented and that losses are tolerated. Incidents are defined as OSHA recordables, property damage cases, fires, explosions, spills or releases to the environment and safety-related work stoppages. In addition, an incident includes an event which could have resulted in one of these outcomes had the circumstances been different ("near miss").
- Active participation by all personnel is required to achieve *Zero Incident Performance*. This includes TtEC, the client, and all Subcontractor personnel.
- Each person on this project is individually responsible and accountable for their safety performance.
- If <u>any</u> incident does occur, it must be reported and investigated to identify root causes, take corrective actions, and communicate the lessons learned.

All TtEC and subcontractor personnel will sign a *ZIP* pledge poster affirming their belief in and commitment to *ZIP*. The *ZIP* Banner will be posted conspicuously at the project site and the hours worked without a loss time incident will also be posted. The TtEC SHSO will continually evaluate planning and project execution to ensure that *ZIP* is embedded in the work process. In addition, awareness programs are utilized to assist in implementation of TtEC's *ZIP* initiative.

A subcontractor, after award of a contract, shall be required to attend a pre-construction Health and Safety Orientation meeting. This meeting will involve the subcontractor's key personnel, and will cover such items as *ZIP* expectations and the Employee Participation Program (EPP).

5.4 Activity Hazard Analyses

The Activity Hazard Analysis (AHA) is a systematic way of identifying the potential health and safety hazards associated with major phases of work on the project and the methods to avoid, control and mitigate those hazards. The AHAs follow the guidance of the TtEC Corporate Program EHS 3-5. AHAs are developed for all activities and will be used to train workers in proper safety procedures during phase preparatory meetings.

AHAs for 2009 and subsequent years' site activities are included in Appendix C of the SHSP. AHAs that are applicable to activities at the SVECS and adjacent areas include:

- General Site Hazards (chemical, biological, and physical hazards)
- Mobilization, Site Preparation and Demobilization
- Monitoring, Sampling, Testing, and Analysis
- Drilling, SVEW Installation, and SVPM Installation
- Excavation/Trenching and Backfilling
- SVECS Installation
- Mobilization/Setup of Treatment Equipment, Startup, and O&M
- Waste Disposal

- Granular Activated Carbon Changeout
- Site Restoration

5.5 Personal Protective Equipment

The personal protective equipment specified in Table 6-1 of the SHSP represents the initial level of PPE selection for each activity required by 29 CFR 1910.132. Specific information on the selection rationale for each activity can be found in the Activity Hazard Analyses. Personal protective equipment selection shall be made by the Site Health and Safety Officer (SHSO) and approved by the PESM. Additional tasks not included in Table 6-1 of the SHSP shall be reviewed by the SHSO and PESM.

Due to the nature of the activities it is not anticipated that upgrading to Level C or B will be required during the site activities. Level D or modified Level D is anticipated for all site work but the SHSO has the responsibility for monitoring site and work conditions and deciding the appropriate level of protection based on indications of potential exposure.

6.0 PROCESS DESCRIPTION AND OPERATION

The process descriptions for the NWIRP Bethpage SVECS, provide the written narrative which explains the individual system loops and their inter-relationship. They describe the setpoints and relationships between the process equipment and the instrumentation used for monitoring the soil vapor treatment process. The process loops are shown in Table 6-1 and the functional descriptions are provided in the following sections.

Table 6-1 Process Loops

SYSTEM No.	TITLE
1	Soil Vapor Extraction Wells
2	Soil Vapor Monitoring
3	Soil Vapor Treatment

6.1 Process Loop # 1 – Soil Vapor Extraction Wells

This process loop corresponds to P&ID P-2. The major equipment for this process loop is listed in Section 6.1.1, the instrumentation and controls and the functional description are included in Section 6.1.2 and the process interlocks are listed in Section 6.1.3.

6.1.1 Major Equipment

Tag Number	Description
SVE-101I	Intermediate Extraction Well
SVE-101D	Deep Extraction Well
SVE-102I	Intermediate Extraction Well
SVE-102D	Deep Extraction Well
SVE-103I	Intermediate Extraction Well

Tag Number	Description
SVE-103D	Deep Extraction Well
SVE-104I	Intermediate Extraction Well
SVE-104D	Deep Extraction Well
SVE-105I	Intermediate Extraction Well
SVE-105D	Deep Extraction Well
SVE-106I	Intermediate Extraction Well
SVE-106D	Deep Extraction Well

6.1.2 System Functional Description

The soil vapor extraction well system consists of twelve SVEWs installed in six clusters, each consisting of one intermediate well and one deep well. Intermediate Wells SVE-101I, SVE-102I, SVE-103I, SVE-104I, SVE-105I, and SVE-106I have a screened interval between 25 and 35 ft bgs. Deep Wells SVE-101D, SVE-102D, SVE-103D, SVE-104D, SVE-105D, and SVE-106D have a screened interval between 40 and 60 ft bgs. Each SVEW is expected to be operated at a design flow rate of 50 cfm for a total flow rate of 600 cfm. Each intermediate depth SVEW requires a vacuum of 4 inches of water column (i.w.) and each deep SVEW requires a vacuum of up to 20 i.w. in order in order to extract the contaminated soil vapors from the targeted depths and locations within Site 1. SVE rates for each well will be controlled by local manual valves. A portable velocity meter will be used to measure air flow while adjusting the control valves. Extraction wells with higher contaminant concentrations (based on PID readings) will be operated at a higher flow rate. Extraction well flow rates will be pulsed periodically (i.e. cycled on/off or adjusted high/low) to prevent stagnant conditions or "dead zones" from developing between adjacent extraction wells.

Instrumentation and controls associated with the Soil Vapor Extraction Wells Process Loop are physically located in the Flow Monitoring Station.

6.1.3 Interlock Summary

There are no interlocks for this process loop.

6.2 Process Loop #2 – Soil Vapor Monitoring

This process loop corresponds to P&ID P-2. The major equipment for this process loop is listed in Section 6.2.1, the instrumentation and controls and the functional description are included in Section 6.2.2 and the process interlocks are listed in Section 6.2.3.

6.2.1 Major Equipment

Tag Number	Description
BFV-101I	Flow Control Valve for SVE-101I
BFV-101D	Flow Control Valve for SVE-101D
BFV-102I	Flow Control Valve for SVE-102I
BFV-102D	Flow Control Valve for SVE-102D
BFV-103I	Flow Control Valve for SVE-103I
BFV-103D	Flow Control Valve for SVE-103D
BFV-104I	Flow Control Valve for SVE-104I
BFV-104D	Flow Control Valve for SVE-104D

Tag Number	Description
BFV-105I	Flow Control Valve for SVE-105I
BFV-105D	Flow Control Valve for SVE-105D
BFV-106I	Flow Control Valve for SVE-106I
BFV-106D	Flow Control Valve for SVE-106D
BV-101I	Isolation Valve Vacuum Gauge for SVE-101I
BV-101D	Isolation Valve Vacuum Gauge for SVE-101D
BV-102I	Isolation Valve Vacuum Gauge for SVE-102I
BV-102D	Isolation Valve Vacuum Gauge for SVE-102D
BV-103I	Isolation Valve Vacuum Gauge for SVE-103I
BV-103D	Isolation Valve Vacuum Gauge for SVE-103D
BV-104I	Isolation Valve Vacuum Gauge for SVE-104I
BV-104D	Isolation Valve Vacuum Gauge for SVE-104D
BV-105I	Isolation Valve Vacuum Gauge for SVE-105I
BV-105D	Isolation Valve Vacuum Gauge for SVE-105D
BV-106I	Isolation Valve Vacuum Gauge for SVE-106I
BV-106D	Isolation Valve Vacuum Gauge for SVE-106D
BV-100	Isolation Valve Vacuum Gauge for manifold in Flow Monitoring Station
BV-101	Isolation Valve Air Bleed to manifold in Flow Monitoring Station
SVPM-2002-S	Shallow Soil Vapor Pressure Monitor
SVPM-2003-S	Shallow Soil Vapor Pressure Monitor
SVPM-2002-I	Intermediate Soil Vapor Pressure Monitor
SVPM-2003-I	Intermediate Soil Vapor Pressure Monitor
SVPM-2004-I	Intermediate Soil Vapor Pressure Monitor
SVPM-2007-I	Intermediate Soil Vapor Pressure Monitor
SVPM-11S	Intermediate Soil Vapor Pressure Monitor
SVPM-12S	Intermediate Soil Vapor Pressure Monitor
SVPM-2002-D	Deep Soil Vapor Pressure Monitor
SVPM-2004-D	Deep Soil Vapor Pressure Monitor
SVPM-2007-D	Deep Soil Vapor Pressure Monitor
SVPM-12	Deep Soil Vapor Pressure Monitor

6.2.2 System Functional Description

The soil vapor monitoring system consists of the Flow Monitoring Station in the southeast corner of Site 1 and the twelve SVPMs, which have been installed to monitor the effectiveness of the SVECS in capturing and containing the contaminated soil vapors in the area east of Site 1. The Flow Monitoring Station consists of an 8 ft wide x 8 ft tall x 20 ft long Conex box in which all the SVE lines collect into a single manifold and from this location a single underground pipeline has been routed to the Treatment Building. The depths of SVPM-2002-S and SVPM-2003-S are 10 ft bgs; the depths of SVPM-2002-I, SVPM-2003-I, SVPM-2004-I, SVPM-2007-I, and SVPM-11S are 25 ft bgs; the depth of SVPM-12S is 27 ft bgs; the depths of SVPM-2002-D, SVPM-2004-D, and SVPM-2007-D are 50 ft bgs; and the depth of SVPM-12 is 52 ft bgs. Each SVPM is equipped with a sealed cap, valve, and threaded sample port.

Instrumentation and controls associated with the Soil Vapor Monitoring Process Loop are summarized in the following table:

Control	Setpoint	Function
Vacuum Indicator PI-101I	0-10 i.w.	Indicates vacuum in line from SVE-101I
Vacuum Indicator PI-101D	0-30 i.w.	Indicates vacuum in line from SVE-101D
Vacuum Indicator PI-102I	0-10 i.w.	Indicates vacuum in line from SVE-102I
Vacuum Indicator PI-102D	0-30 i.w.	Indicates vacuum in line from SVE-102D
Vacuum Indicator PI-103I	0-10 i.w.	Indicates vacuum in line from SVE-103I
Vacuum Indicator PI-103D	0-30 i.w.	Indicates vacuum in line from SVE-103D
Vacuum Indicator PI-104I	0-10 i.w.	Indicates vacuum in line from SVE-104I
Vacuum Indicator PI-104D	0-30 i.w.	Indicates vacuum in line from SVE-104D
Vacuum Indicator PI-105I	0-10 i.w.	Indicates vacuum in line from SVE-105I
Vacuum Indicator PI-105D	0-30 i.w.	Indicates vacuum in line from SVE-105D
Vacuum Indicator PI-106I	0-10 i.w.	Indicates vacuum in line from SVE-106I
Vacuum Indicator PI-106D	0-30 i.w.	Indicates vacuum in line from SVE-106D
Vacuum Indicator PI-100	0-60 i.w.	Indicates vacuum in manifold in Flow Monitoring Station

6.2.3 Interlock Summary

There are no interlocks for this process loop.

6.3 Process Loop #3 – Soil Vapor Treatment

This process loop corresponds to P&ID P-2. The major equipment for this process loop is listed in Section 6.3.1, the instrumentation and controls and the functional description are included in Section 6.3.2 and the process interlocks are listed in Section 6.3.3.

6.3.1 Major Equipment

Tag Number	Description
M-1	Moisture Separator
F-1	Make-up Air Filter/Silencer
F-2	Blower Air Filter
B-1A	Blower B-1A
B-1B	Blower B-1B
VGAC-1	Vapor-phase Granular Activated Carbon Unit
P-1	Condensate Pump
BFV-101	Butterfly Valve Inlet to Moisture Separator
BFV-102	Butterfly Valve Inlet to Make-up Air Filter/Silencer
BFV-103A	Butterfly Valve B-1A Suction Line
BFV-103B	Butterfly Valve B-1B Suction Line
BFV-104A	Butterfly Valve B-1A Discharge Line
BFV-104B	Butterfly Valve B-1B Discharge Line
BV-102	Isolation Valve Low Pressure Switch
BV-103	Isolation Valve Vacuum Gauge Inlet to M-1

Tag Number	Description
BV-104	Isolation Valve Air Bleed Inlet to M-1
BV-105	Isolation Valve Vacuum Gauge Suction Line to Blowers
BV-106	Isolation Valve Pressure Gauge Discharge Line from Blowers
BV-107	Isolation Valve High Pressure Switch
BV-108	Isolation Valve Air Bleed Inlet to VGAC-1
BV-109	Isolation Valve Air Bleed Outlet from VGAC-1
BV-110	Isolation Valve Pressure Gauge Discharge Line from VGAC-1
PRV-101	Pressure (Vacuum) Relief Valve Suction Line to Blowers
PRV-102	Pressure Relief Valve Discharge Line from Blowers

6.3.2 System Functional Description

The soil vapor treatment system consists of a moisture separator tank (M-1), two soil vapor extraction blowers B-1A and B-1B, and an interim vapor-phase granular activated carbon (VGAC-1) unit for removal of chlorinated VOCs from the off-gas. The system will be operated manually and will be shut-down if certain scenarios are encountered. Soil vapor that enters the Treatment Building will first pass through the moisture separator tank (M-1) where any condensate will be separated and removed by a portable condensate pump P-1 into 55-gallon drums on a periodic basis, tested, and disposed of off-site. The vapor from M-1 will be sucked through an air filter (F-2) by any one of two soil vapor extraction blowers (B-1A or B-1B) and then be treated in the VGAC unit (VGAC-1). If necessary, there is also a provision for adding make-up air via air filter-silencer (F-1) to the vapor stream after it leaves tank M-1, prior to air filter F-2. Under normal operation, only one blower will operate and the second one will be on standby. Under special circumstances, both blowers can operate simultaneously in parallel to accommodate higher flow rates. The treated vapor will be discharged from VGAC-1 via an exhaust stack. The SVECS will have a local control panel (LCP). The LCP will comprise of mechanical interlocks and relays and no Programmable Logic Controllers (PLCs) will be used.

The moisture separator tank, M-1 is equipped with a visual sight glass. It also has an integral vacuum relief valve and is equipped with a high condensate level sensor/switch that will shut-down the blowers if the condensate rises to a pre-determined high level. Blowers B-1A and B-1B will have manual start and stop buttons, and reset switches for interlock shutdown scenarios. The soil vapor flow rate from the blowers will be measured by mass flow meter FE-101, transmitted by FQIT-101 and the total flow from M-1 to VGAC-1 will be recorded. A pre-set low vacuum in piping to M-1 inlet or a high condensate level in M-1 or high temperature in the blower discharge line or a high pressure in the blower discharge line will result in shut-down of the blowers and the SVECS. When the SVECS is shut down under any one of these conditions, the LCP will alarm the existing auto-dialer in an adjacent building and the Operator will be notified.

Instrumentation and controls associated with the Soil Vapor Treatment Process Loop are summarized in the table on the next page.

Control	Setpoint	Function
Low Vacuum Switch PSL-101	45 i.w.	Indicates low vacuum in inlet to moisture separator tank, M-1
Vacuum Indicator PI-101	0-60 i.w.	Indicates vacuum in inlet to moisture separator tank, M-1
High Level Switch LSH-101		Indicates high condensate level in moisture separator tank, M-1
Differential Pressure Indicator DPI-101	0-10 i.w.	Indicates differential pressure across blower air filter, F-2
Vacuum Indicator PI-102	0-60 i.w.	Indicates vacuum in suction line to blowers B-1A and B-1B
Pressure Indicator PI-103	0-10 i.w.	Indicates pressure in discharge line from blowers B-1A and B-1B
Temperature Indicator TI-101	20-240 ^{o}F	Indicates temperature in discharge line from blowers B-1A and B-1B
High Temperature Switch TSH-101	140 ^{o}F	Indicates high temperature in discharge line from blowers B-1A and B-1B
High Pressure Switch PSH-101	10 i.w.	Indicates high pressure in discharge line from blowers B-1A and B-1B
Pressure Indicator PI-104	0-10 i.w.	Indicates pressure in discharge line from VGAC-1

6.3.3 Interlock Summary

Signal	Interlock	Result
Low vacuum in piping to M-1 inlet		De-energizes Blowers B-1A and B-1B
High condensate level in M-1		De-energizes Blowers B-1A and B-1B
High temperature in the blower discharge line		De-energizes Blowers B-1A and B-1B
High pressure in the blower discharge line		De-energizes Blowers B-1A and B-1B

7.0 OPERATIONS

7.1 Introduction

The Operations Section of this Plan describes the major equipment for the Soil Vapor Treatment System with respect to its applicable operating parameters and specifications. All issues pertaining to safety within any subsystem are addressed in ***Section 5.0, Health and Safety.***

Appendix D, Manufacturers' O&M Manuals, contains copies of the O&M information for the major equipment components.

Set points for all equipment can be found in Section 6. Although set points have the potential for change over time, the Start-Up and Shut-down procedures will act as a good base and reference.

The ***Master Equipment List, located in Appendix D***, is a summary of all pertinent information relative to the treatment/process equipment. The Operator is also directed to the on-site computer copy of this list for information on all SVECS equipment.

7.2 Soil Vapor Treatment

7.2.1 Equipment Specifications

Refer to Manufacturer's O&M Manual (Appendix D) for further information.

Moisture Separator Tank

Tag No.: M-1
Name: Moisture Separator Tank
Type: Vertical, Cylindrical, Closed-top, Vented
Rating: 1,000 Gallons, 5 ft DIA 4 ft H sideshell
Manufacturer: Tetrasolv Filtration

Soil Vapor Extraction Blowers

Tag No: B-1A and B-1B
Name: Soil Vapor Extraction Blower
Rating: 600 CFM, 40 i.w.
Manufacturer: National Turbine Corporation
Model: Millennium Series Model M24-319R
Serial No.: 291055-A and 291055-B
Motor
Manufacturer: WEG Electric Corporation
Rating: 7.5 HP, 460V 60Hz 3Phase, Induction
Model: 00735OP3E184T

Vapor-phase Granular Activated Carbon Adsorber

Tag No.: VGAC-1
Name: Vapor Phase Granular Activated Carbon Adsorber
Type: Rectangular Carbon Adsorption Vessel
Rating: 1,000 CFM
Operating Conditions: 5 i.w. max pressure
Manufacturer: Tetrasolv Filtration
Model: VF-5000
Carbon Details: 4 x 10 US mesh virgin carbon

7.2.2 Operation and Controls

The soil vapor that is extracted from the twelve SVEWs will be collected in a single manifold within the Flow Monitoring Station and enter the treatment system within Building 03-35 via an underground pipeline. In the Treatment Building, the soil vapor at approximately 600 cfm will first pass through a 1,000 gallon moisture separator tank, M-1, where any condensate will be separated and removed by a portable pump P-1 into 55-gallon drums on a periodic basis. Tank M-1 is equipped with a visual sight glass. It also has an integral vacuum relief valve and is equipped with a high condensate level sensor/switch that will shut-down the blowers if the condensate rises to a pre-determined high level. The vapor from M-1 will be sucked through air filter F-2 by any one of two soil vapor extraction blowers (B-1A or B-1B) and then be treated in VGAC-1. Blowers B-1A and B-1B will have manual start and stop buttons, and reset switches for interlocked shutdown scenarios. The soil vapor flow rate from the blowers

will be measured by mass flow meter FE-101, transmitted by FQIT-101 and the total flow from M-1 to VGAC-1 will be recorded. If necessary, there is also a provision for adding make-up air via air filter-silencer F-1 to the vapor stream after it leaves tank M-1, prior to air filter F-2. Under normal operation, only one blower will operate and the second one will be on standby. Under special circumstances, both blowers can operate simultaneously in parallel to accommodate higher flow rates. The treated vapor will be discharged from VGAC-1 via an exhaust stack.

A pre-set low vacuum in piping to M-1 inlet or a high condensate level in M-1 or high temperature in the blower discharge line or a high pressure in the blower discharge line will result in shut-down of the blowers and the SVECS. When the SVECS is shut down under any one of these conditions, the LCP will signal the existing Auto-Dialer in an adjacent building and the Operator will be notified.

7.3 Start-up and Shut-down Procedures

1. Normal Start-up

    a. Verify that VGAC-1 contains activated carbon and that F-1 and F-2 contain filter elements.
    b. Check valve positions to make sure the necessary valves are set in proper positions:
        i. In the Flow Monitoring Station, open flow control valves BFV-101I, BFV-101D, BFV-102I, BFV-102D, BFV-103I, BFV-103D, BFV-104I, BFV-104D, BFV-105I, BFV-105D, BFV-106I, and BFV-106D.
        ii. If Blower B-1A will be running and Blower B-1B will serve as a spare, close BFV-103B and BFV-104B and open BFV-103A and BFV-104A. However, if Blower B-1B will be running and Blower B-1A will serve as a spare, close BFV-103A and BFV-104A and open BFV-103B and BFV-104B.
        iii. Open BFV-101 and close BFV-102.
        iv. Verify that the condensate level in M-1 is sufficiently low, If not, empty the condensate into 55-gallon drums using portable condensate pump P-1.
    c. Start Blower B-1A or Blower B-1B, as required.

2. Normal Shut-down

    a. At the LCP, shut-down Blower B-1A or Blower B-1B, as required.
    b. Empty the condensate in M-1 into 55-gallon drums using portable condensate pump P-1.
    c. Optional – Shut off valves from SVEWs in the Flow Monitoring Station.
    d. Optional – Shut off valve BFV-101 at tank M-1.
    e. Optional – Shut off valves BFV-104A and BFV-104B at blower discharges.

3. Emergency Shutdown

    a. Activate Emergency Shutdown Button on LCP.

8.0 SYSTEM TROUBLESHOOTING

If any portion of the SVECS is not operating properly, the Operator will be required to take steps to restore the particular part of the SVECS to its proper state of operation. This Section summarizes general actions which can be taken to troubleshoot potential problems. Troubleshooting activities must be

performed in compliance with the safety guidelines in ***Section 5.0, Health and Safety***, and applicable federal, state, and local safety regulations.

For the Operator to troubleshoot the proper operation of the SVECS, recognition of the safety hazards and the ability to follow safe procedures, along with the knowledge of how the equipment is supposed to function and the physical and chemical processes involved are required. The following tables provide a brief description of information that can help in troubleshooting. The areas of operation for which troubleshooting guidelines are provided in this section include:

Table 8-1: Soil Vapor Extraction Troubleshooting
Table 8-2: Moisture Separator Troubleshooting
Table 8-3: Blower Troubleshooting
Table 8-4: Vapor-Phase Carbon Adsorber Troubleshooting

More specific equipment troubleshooting information is provided in the Manufacturer's Operations and Maintenance Manuals located in Appendix D. In conjunction, this information will assist the Operator in locating and eliminating sources of dysfunction in the equipment or process operation. Should the Operator require additional assistance in troubleshooting, TtEC will be ressponsible for providing the additional expertise in the resolution of technical issues relating to operation and maintenance.

Table 8-1 Soil Vapor Extraction Troubleshooting

Problem	Potential Cause	Corrective Action
Soil vapor line from Flow Monitoring Station to Treatment Building has no or low flow	Valves closed upstream or downstream	Shut off blower. Check manual valves upstream and downstream of blower and in Flow Monitoring Station, ensure they are in the "Open" position, and restart blower.
	Leak in pipe or air bleed ports	Shut off blower; repair or replace line. Seal or replace caps on ports.
	Blockage in cleanout ports or excess condensate collected in transfer line	Remove condensate from cleanout ports.

Table 8-2 Moisture Separator Troubleshooting

Problem	Potential Cause	Corrective Action
Condensate level too high	Malfunctioning pump operation	Refer to Table 8-1.
	Malfunctioning level switch	Check, readjust, or replace if necessary.

Table 8-3 Blower Troubleshooting

Problem	Potential Cause	Corrective Action
Blower does not operate	Switch in "Off" Position	Change switch to "On" position
	Interlock/Alarm condition	Check for interlocks/alarm conditions which may shut down blower.
	Circuit overload	Check circuit breaker at LCP. Reset if necessary. Determine cause of overload.
	Thermal overload	Check thermal overload protection relay at LCP and reset if necessary. Determine cause of overload.
Blower has no or low flow	Valves closed upstream or downstream	Shut off blower. Check manual valves upstream and downstream of blower, ensure they are in the "Open" position, and restart blower.
	Leak in pipeline	Shut off blower; repair or replace pipeline.
	Flow control setting too low	Check positions of valves.
Blower has high flow	Flow control setting too high	Check positions of valves.

Table 8-4 Vapor-Phase Carbon Adsorber Troubleshooting

Problem	Potential Cause	Corrective Action
High pressure drop or low soil vapor flow across system	Buildup of salts in carbon bed	Check position of inlet damper. Clean or replace carbon.
	Foreign object blocking flow path	Remove object.
	Carbon bed has become wet	Blow dry air through bed.
VOCs present in outlet from unit	Carbon capacity been exceeded	Replace carbon.
	Channeling of flow through bed	Level and redistribute carbon.

9.0 EQUIPMENT MAINTENANCE

First and foremost, it is imperative that all operations and maintenance tasks be performed with strict adherence to the APP and SHSP. Lock-out and tag-out (LO/TO) safety procedures must be followed during all equipment maintenance in accordance with requirements specified in the SHSP.

The key to good maintenance is regular and systematic inspection of all equipment. Inspection frequency and preventative maintenance is determined by the process application and local conditions such as temperature, dust and operation runtime. The ***Daily Inspection Form, Appendix A, Report Forms*** is provided as the documentation format for the Operator's use during daily shift inspections.

A sound program carried out by qualified individuals will greatly increase equipment reliability and productivity. The manufacturers' instruction manuals, referenced in ***Appendix D, Manufacturers' O&M Manuals*** and located on-site, must be carefully studied by the Operator before any attempt is made to service a particular piece of equipment.

Master Equipment List, Appendix D, has been created to act as a quick reference for the Operator to all necessary maintenance information. The list is an electronic spreadsheet defining all major equipment, instruments and valves with respect to part number, equipment description, vendor name and contact telephone number.

9.1 Alarm Responses

The Auto Dialer system as described in ***Section 6.0, Process Description and Operation*** interfaces directly with the process equipment and identifies emergency/shut-down/alarm conditions in the SVECS. In the event of a shut-down condition, the Auto Dialer system will call the Operator. In the event of a shut-down condition that remains unacknowledged after a set amount of time, the Auto Dialer system will initiate a series of phone calls to alert alternate personnel of shut-down/alarm conditions so that corrective action may be taken.

9.2 Maintenance Procedures and Recording

A total maintenance program has been developed for the process equipment which combines corrective and preventative maintenance. The preventative maintenance and frequency information for each piece of equipment is included in **Appendix D, Manufacturers' O&M Manuals.** Recording of performed maintenance tasks is to be documented on the ***Equipment Maintenance Form, Appendix A, Report Forms*** for each piece of equipment.

It is important to note that all operations and maintenance tasks be performed with strict adherence to the SHSP.

9.2.1 Tools, Equipment, and Supplies

To maintain and repair equipment, the proper tools must be readily available on-site. A complete list of available site tools is included as ***Appendix B, Maintenance and Monitoring Equipment and Tool List.***

Spare parts, lubricants and other supplies necessary for routine equipment repairs and maintenance are to be stocked in the SVECS. A spare parts inventory list is included as ***Appendix C, Spare Parts Inventory.*** Manufacturers' recommended parts constitute most of the list.

Seasonal building and grounds-keeping equipment, such as snow shovels, are to be stored on-site and maintained when not in use.

9.2.2 Housekeeping

The SVECS should be kept in a neat and orderly appearance to provide a safe and pleasant working environment. To maintain a clean and safe workplace, the Operator should create a housekeeping plan and schedule. The housekeeping tasks should include both interior and exterior work. Regular yard pickup and inside sweeping, weekly mopping, along with seasonal snow removal will be performed by the Operator/SVECS staff.

9.2.3 Lubrication

Proper lubrication of motors and bearings will insure longer equipment run time and efficient operation. Recommended lubrication intervals and types of oils and greases as supplied by the vendor are to be followed. The schedules will be adjusted to conform to heavier usage of the equipment.

LO/TO safety procedures will be followed during all equipment maintenance in accordance with requirements specified in ***Section 5.0, Health and Safety***. Some of the motors and fan bearings, however, must be greased while in motion. Safety procedures applicable to this energized maintenance are to be followed.

Under or over lubrication of bearings can be harmful to their life expectancy. Excessive grease will cause the bearings to slide rather than rotate, increasing friction and causing heat buildup. The following general instructions are recommended:

1. Assure that the grease gun tip is clean.
2. Clean the grease fitting with a clean rag. If a plug is to be removed, clean the area round the plug before removal of plug and inserting grease fitting.
3. Remove any relief plug or vent before pumping in grease.
4. Pump the proper amount of grease indicated by information found in the manufacturer's instructions. This information is included (along with frequency of greasing) in the manufacturer's operation and maintenance manuals referenced in ***Appendix D, Manufacturers' O&M Manuals.***
5. Wipe off all excessive grease around unit.
6. Clean vent before replacing vent plug to allow for expansion of grease and to allow excess grease to work out of the bearing.
7. Note in the maintenance records the date, Operator or service personnel and what was done to the equipment.

9.2.4 Storage of Lubricants

An area in the SVECS has been designated as a storage area for maintenance lubricants. This area will be configured to prevent any fire or safety hazard and will be posted with "NO SMOKING" signs. Stored lubricants will be tightly sealed to prevent contamination by dust and dirt, and decomposition of the lubricant.

9.2.5 Equipment Rotation

Equipment with multiple blowers arrangement is automatically run in an alternating fashion so that all blowers maintain approximate equal hours of operation. The Operator shall monitor and record equipment runtimes to verify that rotation of blowers is operating appropriately.

9.2.6 Electrical

CAUTION: Maintenance work performed on exposed live electrical conductors and connections will be done by a licensed electrician using the N.F.P.A. 70 E standard. Routine service to the equipment beyond the Operator's experience, will be performed by 40 Hour trained OSHA field technicians.

9.3 Maintenance Schedule Matrix

A total maintenance program has been developed for the process equipment which combines corrective and preventative maintenance. The preventative maintenance and frequency information for each piece of equipment (Tag No.) has been summarized in a Preventative Maintenance Matrix***, Appendix E, Preventative Maintenance Matrix***. Recording of performed maintenance tasks is to be documented on the ***Equipment Maintenance Form, Appendix A, Report Forms*** for each piece of equipment.

It is important to note that all operations and maintenance tasks be performed with strict adherence to Section 5.0, Health and Safety.

9.4 Special Maintenance Procedures

9.4.1 Contaminated Condensate or Chemical Spill - Operational Response

Should a large spill of condensate occur, the Operator shall immediately shutdown the SVECS and verify that the condensate is properly collecting in the moisture separator tank M-1. The Operator should then rectify the cause of the spill and resume SVECS operation when it is safe to do so. Normal SVECS operations do not require the use of process chemicals. In the unlikely event of a chemical spill (e.g. cleaning chemicals) the spill should be isolated using absorbent materials or booms. The Operator should consult Health and Safety personnel and review the MSDS to determine further action. If it is determined safe to do and will not adversely affect the SVECS processes, the chemical spill shall be properly cleaned up, drummed, and disposed of off-site. Refer to ***Section 5.0, Health and Safety*** for all safety issues pertaining to chemical spills.

9.4.2 Vapor-Phase Granular Activated Carbon Change-out

Prior to the process of carbon change-out, proper procedures must be followed and a review of effluent analytical data must be performed to make a proper decision on when to replace the carbon in the adsorber vessel. Refer to ***Section 4*** of this O&M Plan for a narrative on the sampling procedures required for this evaluation and the Tetrasolv Filtration O&M Manual in ***Appendix D*** for the carbon replacement procedures.

10.0 WASTE TRANSPORTATION AND DISPOSAL

10.1 Background

The SVECS remediation will result in the generation of waste materials at the Site 1Treatment Building at NWIRP Bethpage, NY. This section describes the process and methods that will be used to address the safe and compliant handling and transport of generated project wastes from the SVECS. The facility will operate 24 hours per day, 7 days per week. Maintenance activities will be performed on an as-needed basis. Wastes at the SVECS will consist of spent granular activated carbon, spent air filters, condensate in 55-gallon drums and used personal protective equipment (PPE). It is anticipated that the stored wastes will be non-hazardous and therefore will not require storage and will not require manifests for off-site transportation. The wastes will be manifested as either non-hazardous or hazardous waste depending on the waste profile, for offsite transportation and appropriate disposal. The procedures outlined in the Final Work Plan (Tetra Tech EC October 15, 2009) will be followed.

10.2 Waste Disposal Criteria and Methods

Before wastes are transported from the SVECS, they will be sampled and analyzed as described in Section 4 of this document and the associated SAP. This sampling and analysis will comply with the regulatory requirements identified in Section 2 of this document as well as the requirements of the disposal facilities.

10.3 Waste Disposal Facilities

10.3.1 Disposal Facility for Hazardous Wastes

It is anticipated that hazardous wastes from the SVECS will be transported via trucks and disposed of at a NYSDEC approved RCRA Subtitle C hazardous waste landfill. A particular waste disposal facility has not been identified at present.

10.3.2 Disposal Facility for Non-Hazardous Wastes

It is anticipated that non-hazardous wastes from the SVECS will be transported via trucks and disposed of at a NYSDEC approved RCRA Subtitle D solid waste landfill. A particular waste disposal facility has not been identified at present.

10.4 Waste Transportation Contractor Requirements

All Waste Transportation Contractors (transporters) must use the disposal facilities identified above, or perhaps others, that have been approved in advance by Tetra Tech, the Navy, USEPA and NYSDEC.

10.4.1 Qualifications

All waste transporters will be prequalified according to Tetra Tech's regulatory compliance screening process prior to being awarded a transportation subcontract to work on the project. All drivers will have a current commercial driver's license (CDL) with HAZMAT endorsement as required.

10.4.2 Trucking Equipment

Transport vehicles brought to the SVECS will be in good operating condition and substantially free of mud or other contamination. Owners and operators of transport vehicles will be responsible for maintaining their equipment in a safe operating condition suitable for transport over public roads in accordance with applicable motor carrier safety requirements.

Transport vehicles will meet the required specifications for hauling hazardous and non-hazardous solid wastes. These specifications include use of covers and tight dump bodies to prevent leakage and display of the appropriate USDOT-required placards.

10.5 Waste Quantity Determination

Estimated quantities of wastes likely to be produced will be developed after gaining some operating experience over the first several months of operation in 2010.

10.6 Shipping Documentation

Tracking and documentation of waste transport is required by the federal and state solid waste, hazardous waste, and USDOT transportation and hazardous materials regulations. For hazardous wastes, a Uniform Hazardous Waste Manifest and a weight ticket are required. For non-hazardous wastes, a Bill of Lading or a non-hazardous waste manifest is required.

10.7 Safety

10.7.1 Facility Safety

Facility personnel and transporters will receive training in the project-specific SHSP at the SVECS facility. The SHSP includes requirements for traffic control, loading/unloading operations, and site rules to follow when driving within the facility.

10.7.2 Public Road Transport Safety

Transporters of hazardous and solid waste materials will comply with applicable federal and state regulations for transportation of wastes over public roadways. These regulations include:

USDOT Hazardous Materials Requirements (49 CFR 171-397);
NYSDOT Height/Weight Restrictions (17 NYCRR Part 820);
NY State Transportation Law (TRA Section 140)

10.7.3 Landfill Facilities Safety

Transporters will adhere to the landfill-specific rules for access and unloading of wastes. When trucks enter the landfill facilities, drivers will be informed about and will abide by site-specific traffic control procedures for each landfill. Before exiting the facility, trucks will be visually inspected and decontaminated as needed to remove any residue on the exterior of the truck. The receiving landfill will coordinate and manage incoming truck traffic such that delays and traffic impacts are minimized. SVECS operations personnel will coordinate delivery of waste with offsite landfills in advance of shipments so that they are informed about the composition, delivery method, and schedule for the waste. Waste profiles and supporting documentation (e.g., sample results) will be prepared, signed by the NWIRP Bethpage representative, and forwarded to the landfills in advance of shipment as required.

10.8 Spill Response and Contingency Plan

10.8.1 Spill Procedures

The primary obligation for reporting and cleaning up a hazardous materials spill that occurs during transportation lies with the owner and operator of the truck from which the material has been released. TtEC will require that transporters of hazardous materials be familiar with the contents of the spill response and contingency plan, comply with all current rules governing the transportation, and have an emergency spill response plan in effect as part of their contract. Drivers will be trained in transportation spill response and be equipped with spill response equipment appropriate for responding to spills of hazardous and non-hazardous wastes. Such response equipment will include a shovel, bags, booms, cones, or other means to demarcate the spill area. Training will also address the general spill response objectives and procedures, which include:

Safeguard life and property
Notify the proper authorities
Begin containment and cleanup
Follow-up with reporting.

10.8.2 Notification

Transporters will immediately report spills of hazardous substances in accordance with the NYSDEC spill reporting requirements. Additionally, any transportation incident involving hazardous materials will be reported to the USDOT as required by the regulations. All spills on site and during transportation must also be reported to the Navy/Navy's Representative, Mr. Greg Pearman at (860) 235-2040.

Samples of the Uniform Hazardous Waste Manifest Form, the Bill of Lading, a Non-Hazardous Waste Label, and a Hazardous Waste Label are shown in Figures 10-1 through 10-4 respectively.

Please print or type. (Form designed for use on elite (12-pitch) typewriter.)

Form Approved. OMB No. 2050-0039

UNIFORM HAZARDOUS WASTE MANIFEST

1. Generator ID Number	2. Page 1 of	3. Emergency Response Phone	**4. Manifest Tracking Number**

GENERATOR

5. Generator's Name and Mailing Address

Generator's Site Address (if different than mailing address)

Generator's Phone:

6. Transporter 1 Company Name — U.S. EPA ID Number

7. Transporter 2 Company Name — U.S. EPA ID Number

8. Designated Facility Name and Site Address — U.S. EPA ID Number

Facility's Phone:

9a. HM	9b. U.S. DOT Description (including Proper Shipping Name, Hazard Class, ID Number, and Packing Group (if any))	10. Containers No.	10. Containers Type	11. Total Quantity	12. Unit Wt./Vol.	13. Waste Codes
	1.					
	2.					
	3.					
	4.					

14. Special Handling Instructions and Additional Information

15. **GENERATOR'S/OFFEROR'S CERTIFICATION:** I hereby declare that the contents of this consignment are fully and accurately described above by the proper shipping name, and are classified, packaged, marked and labeled/placarded, and are in all respects in proper condition for transport according to applicable international and national governmental regulations. If export shipment and I am the Primary Exporter, I certify that the contents of this consignment conform to the terms of the attached EPA Acknowledgment of Consent.
I certify that the waste minimization statement identified in 40 CFR 262.27(a) (if I am a large quantity generator) or (b) (if I am a small quantity generator) is true.

Generator's/Offeror's Printed/Typed Name — Signature — Month — Day — Year

INT'L

16. International Shipments ☐ Import to U.S. ☐ Export from U.S. Port of entry/exit: _____

Transporter signature (for exports only): Date leaving U.S.:

TRANSPORTER

17. Transporter Acknowledgment of Receipt of Materials

Transporter 1 Printed/Typed Name — Signature — Month — Day — Year

Transporter 2 Printed/Typed Name — Signature — Month — Day — Year

DESIGNATED FACILITY

18. Discrepancy

18a. Discrepancy Indication Space ☐ Quantity ☐ Type ☐ Residue ☐ Partial Rejection ☐ Full Rejection

Manifest Reference Number:

18b. Alternate Facility (or Generator) — U.S. EPA ID Number

Facility's Phone:

18c. Signature of Alternate Facility (or Generator) — Month — Day — Year

19. Hazardous Waste Report Management Method Codes (i.e., codes for hazardous waste treatment, disposal, and recycling systems)

1.	2.	3.	4.

20. Designated Facility Owner or Operator: Certification of receipt of hazardous materials covered by the manifest except as noted in Item 18a

Printed/Typed Name — Signature — Month — Day — Year

VOID

STRAIGHT BILL OF LADING – SHORT FORM – Original – Not Negotiable

Shipper's No. _____

(Carrier) _____ SCAC. _____ Carrier's No. _____

RECEIVED, subject to individually determined rates or contracts that have been agreed upon in writing between the carrier and shipper, if applicable, otherwise to the rates, classifications and rules that have been established by the carrier and are available to the shipper, on request; and all applicable state and federal regulations;

at _____, date _____ from _____

the Property described below, in apparent good order, except as noted (contents and condition of contents of packages unknown), marked, consigned, and destined as indicated below which said company (the word company being understood throughout this contract as meaning any person or corporation in possession of the property under the contract) agrees to carry to delivery at said destination, if on its route, or otherwise to deliver to another carrier on the route to said destination. It is mutually agreed as to each carrier of all or any of said Property over all or any portion of said route to destination and as to each party at any time interested in all or any of said Property that every service to be performed hereunder shall be subject to all the conditions not prohibited by law, whether printed or written, herein contained, including the conditions on the back hereof, which are hereby agreed to by the shipper and accepted for himself and his assigns.

TO: Consignee	FROM: Shipper
Street	Street
Destination Zip	Origin Zip
Route	
Telephone ( ) Fax ( )	Telephone ( ) F ( )
E-mail	E-mail
Delivering Carrier	Trailer Initial/Number

No. of Packages	Type of Packages	Type of Food Brand Name/Specific Variety	Lot. Code or Identifier No.	Weight (Subject to correction)	Class or Rate

SAMPLE

Remit C.O.D. to:
Address:
City: State: Zip:

COD AMT: $

Charges Advanced $_____

Subject to Section 7 of conditions, if this shipment is to be delivered to the consignee without recourse on the consignor, the consignor shall sign the following statement:
The carrier shall not make delivery of this shipment without payment of freight and all other lawful charges.

(Signature of consignor)

C. O. D. FEE:
Prepaid ☐
Collect ☐ $

FREIGHT CHARGES
☐ Prepaid ☐ Collect

Note – where the rate is dependent on value, shippers are required to state specifically in writing the agreed or declared value of the property.
The agreed or declared value of the property is hereby _____ specifically stated by the shipper to be not exceeding _____ per _____
NOTE: Liability Limitation for loss or damage in this shipment may be applicable. See 49 U.S.C. 14706(c)(1)(A) and (B).

Shipper _____ Carrier _____

Per _____ Date _____ Per _____ Date _____

Consignee _____ Date received _____

51-BLC-O3 9080

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TERMS AND CONDITIONS

By giving the carrier the property described in this bill of lading (the "Property"), you agree to all of the terms of this bill of lading.

Section 1 Limitations of Liability

(a) The carrier or party in possession of the Property shall be liable as at common law for any loss of or damage to such Property, except as hereinafter provided.

(b) The carrier shall not be liable for loss of, damage to or delay in delivery of the Property:

(i) caused by an act of God, the public enemy, the authority of law, or any act or default by you and/or the owner of the Property, or for natural shrinkage.

(ii) occurring while the Property is stopped and held in transit at your request or that of any other party entitled to make such request.

(iii) resulting from a defect or vice in the Property, or from riots or strikes.

(c) To the extent permitted under the Carmark Amendment, the liability of the carrier for the Property may be limited to a value established by written or electronic declaration by you or by written agreement between the carrier and you. In all cases not prohibited by law, where a lower value than actual value has been represented in writing by the shipper or has been agreed upon in writing as the released value of the Property as determined by the classification or tariffs upon which the rate is based, such lower value plus freight charges if paid shall be the maximum amount to be recovered, whether or not such loss or damage occurs from negligence.

Section 2 Filing of Claims

(a) Claims against the carrier for loss of or damage to the Property must be filed in writing with the carrier issuing this bill of lading within nine months after delivery of the Property (or, in case of export traffic, within nine months after delivery at port of export) or, in case of failure to make delivery, then within nine months after a reasonable time for delivery has elapsed. Any action must be instituted within two years following the date written notice is given by the carrier to you that the carrier has disallowed the claim or any part or portion specified in the notice. If your claim or action is not filed and prosecuted in accordance with the foregoing provisions, all claims shall be liable, and such claims may not be paid.

(b) The carrier shall have the benefit of any insurance that may have been effected upon or on account of the Property in the event that the carrier becomes liable for loss of or damage to the Property.

Section 3 Method of Transportation

Except as agreed in writing in this bill of lading, the carrier is authorized to transport the Property by any particular motor vehicle, or in time for any particular market or otherwise than with reasonable dispatch. The carrier may, in case of physical necessity to forward the Property, transfer or store between the point of shipment and the point of destination.

Section 4 Responsibility for Property

(a) If the Property is not removed by the party entitled to receive it within the time allowed by tariffs or classifications upon which the rate is based, (such free time to be computed as therein provided), the carrier may notify the receiving party of the arrival of the Property at the destination or at the port of export (if intended for export). The carrier, in its discretion, may store the Property in a public or licensed warehouse at the place of delivery or other available place, at the cost of the owner. The stored Property will be subject to a lien for all freight and other lawful charges, including a reasonable charge for storage. The carrier's responsibility shall be that of a warehouseman only.

(b) Except as provided in subparagraph 4(c) below, if the Property is refused by consignee or the party entitled to receive it, or said consignee or party entitled to receive it fails to receive it within 15 days after notice of arrival shall have been duly sent or given, the carrier may sell the Property at public auction to the highest bidder, at such place as may be designated by the carrier. Prior to any such sale, the carrier shall use commercially reasonable efforts to notify you that the Property has been refused or remains unclaimed, as the case may be, and that it will be subject to sale under the terms of the bill of lading if you do not arrange for an alternative disposition.

(c) If the Property is perishable and is refused by the consignee or party entitled to receive it at the destination location, or said consignee or party entitled to receive it shall fail to receive it promptly, the carrier, may, in its discretion, to prevent deterioration or further deterioration, sell the same to the best advantage at private or public sale. Prior to selling the Property, the carrier shall use commercially reasonable efforts to notify you of the refusal of the Property or the failure to receive it, and request instructions regarding disposition of the Property.

(d) If the procedure described in subsection (b) and (c) is not commercially reasonable, the carrier may, at its option, sell the Property under such circumstances and in such manner as may be authorized by law.

(e) The carrier shall apply the proceeds of any sale made under this section to the payment of freight, demurrage, storage, and any other lawful charges and the expenses of notice, advertisement, sale, and other necessary expenses and of caring for and maintaining the Property, if the care of the same requires special expense. If following the payment of the preceding there is a balance, such balance shall be paid to the owner of the Property sold hereunder.

(f) If you direct the carrier to deliver the Property to a location where there is no regularly appointed agent, the carrier shall not be liable for any loss or damage to the Property during at such location after the Property has been unloaded at such location.

Section 5 Valuation Claims

(a) The carrier's liability in connection with the Property is limited to the lesser of the amount of your actual damages or the declared stipulated value of the Property as entered on the face of this bill of lading plus any freight charges paid.

(b) The carrier shall not be liable in any way for any documents, money, or for any articles of extraordinary value not specifically rated in the published classifications or tariffs unless a special agreement to do so and a stipulated value of the articles are endorsed on this bill of lading.

Section 6 Joint Liability for Hazardous Goods

You, and if you are an agent, any owner of the Property, shall be joint and severally liable for and indemnify the carrier against all loss or damage caused by the shipment of explosives, dangerous or hazardous goods, without giving prior written notice to the carrier of their nature. At the discretion of the carrier, any such goods may be warehoused at your and the owner's risk and expense or destroyed without compensation.

Section 7 Freight Charges and Payment

(a) You are primarily responsible for the freight and all other lawful charges, unless you stipulate in writing in the space provided for that purpose on the face of this bill of lading that the carrier shall not make delivery without requiring payment of such charges and the carrier makes delivery without requiring such payment. If you provide erroneous information that results in the shipment being reconsigned or diverted to a location other than the location identified in the original bill of lading, you shall be liable for such additional charges. The respective liability of you and the consignee for additional charges provided for herein shall be pursuant to 49 U.S.C. § 13706.

(b) Nothing in this bill of lading shall limit the right of the carrier to require the prepayment or guarantee of charges at time of shipment. If upon inspection the carrier determines that the articles shipped are not those described in this bill of lading, the freight charges must be paid upon the articles actually shipped.

Section 8 Effect of Shipper Signature

If this bill of lading is issued on the order of the shipper, or his agent, in exchange or in substitution for another bill of lading, the shipper's signature to the prior bill of lading as to the statement of value or otherwise, or election of common law or bill of lading liability, in or in connection with such prior bill of lading, shall be considered a part of this bill of lading as fully as if the same were written or made in or in connection with this bill of lading.

Section 9 Transport by Water

If all or any part of the Property is carried by water over any part of said route, and any loss of or damage to the Property occurs while it is in the custody of the carrier providing the water carriage, the liability of such carrier shall be determined by that carrier's bill of lading and by the laws and regulations applicable to transportation by water. Such water carriage shall be performed subject to all of the terms and provisions of, and all the exemptions from liability contained in the Harter Act or the Carriage of Goods By Sea Act, as applicable.

SAMPLE

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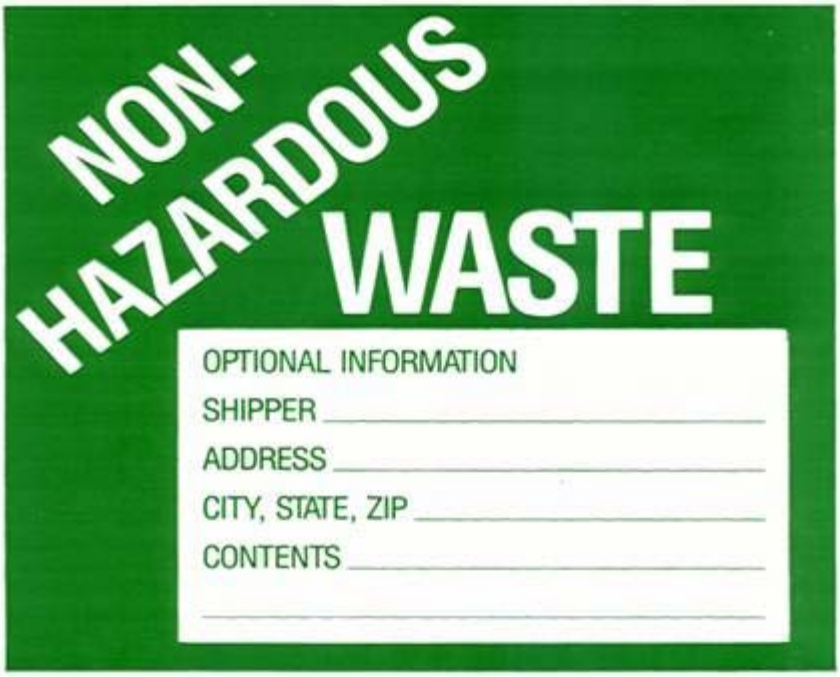


NON-HAZARDOUS WASTE

HAZARDOUS
WASTE
FEDERAL LAW PROHIBITS IMPROPER DISPOSAL.
IF FOUND, CONTACT THE NEAREST POLICE OR PUBLIC SAFETY
AUTHORITY OR THE U.S. ENVIRONMENTAL PROTECTION AGENCY.
GENERATOR INFORMATION:
NAME
ADDRESS
PHONE
CITY
STATE
ZIP
EPA
ID NO.
MANIFEST
DOCUMENT NO.
ACCUMULATION
START DATE
EPA
WASTE NO.
D.O.T. PROPER SHIPPING NAME AND UN OR NA NO. WITH PREFIX
HANDLE WITH CARE!
STYLE CFWM67

APPENDIX A

Report Forms, SOPs, Drawings, MSDS

Inspection Form
Equipment Maintenance Form
Collection of Condensate (Aqueous) Samples SOP 001
Collection of Soil Vapor Samples using Summa Canisters SOP 002
Collection of Soil Vapor Samples using Tedlar Bags SOP 003
SVECS Record Drawings
MSDS

A-1
Inspection Form

Site 1, Former Drum Marshalling Area
Soil Vapor Extraction Containment System
NWIRP Bethpage, NY

INSPECTION FORM

Inspector's Name: _____ **Date:** _____

Time Began: _____ **Time Finished:** _____

EQUIPMENT DESCRIPTION	VISUAL INSPECTION (Circle one)	SYSTEM PARAMETERS (Circle one or Fill in the blank)	COMMENTS
Flow Monitoring Station	Yes No	Total VOCs in Breathing Zone _____from PID	
Extraction Well SVE-101I	Yes No	Vacuum (PI-101I): _____ i.w. Velocity _____m/s Total VOCs _____from PID/Tedlar Bag	
Extraction Well SVE-101D	Yes No	Vacuum (PI-101D): _____ i.w. Velocity _____m/s Total VOCs _____from PID/Tedlar Bag	
Extraction Well SVE-102I	Yes No	Vacuum (PI-102I): _____ i.w. Velocity _____m/s Total VOCs _____from PID/Tedlar Bag	
Extraction Well SVE-102D	Yes No	Vacuum (PI-102D): _____ i.w. Velocity _____m/s Total VOCs _____from PID/Tedlar Bag	
Extraction Well SVE-103I	Yes No	Vacuum (PI-103I): _____ i.w. Velocity _____m/s Total VOCs _____from PID/Tedlar Bag	
Extraction Well SVE-103D	Yes No	Vacuum (PI-103D): _____ i.w. Velocity _____m/s Total VOCs _____from PID/Tedlar Bag	
Extraction Well SVE-104I	Yes No	Vacuum (PI-104I): _____ i.w. Velocity _____m/s Total VOCs _____from PID/Tedlar Bag	
Extraction Well SVE-104D	Yes No	Vacuum (PI-104D): _____ i.w. Velocity _____m/s Total VOCs _____from PID/Tedlar Bag	
Extraction Well SVE-105I	Yes No	Vacuum (PI-105I): _____ i.w. Velocity _____m/s Total VOCs _____from PID/Tedlar Bag	
Extraction Well SVE-105D	Yes No	Vacuum (PI-105D): _____ i.w. Velocity _____m/s Total VOCs _____from PID/Tedlar Bag	
Extraction Well SVE-106I	Yes No	Vacuum (PI-106I): _____ i.w. Velocity _____m/s Total VOCs _____from PID/Tedlar Bag	
Extraction Well SVE-106D	Yes No	Vacuum (PI-106D): _____ i.w. Velocity _____m/s Total VOCs _____from PID/Tedlar Bag	
Flow Monitoring Station Manifold	Yes No	Vacuum (PI-100): _____ i.w.	
Moisture Separator Tank M-1	Yes No	Vacuum (PI-101): _____ i.w. Condensate level _____ feet	
Air Filters F-1 F-2	Yes No	F-1: Filter Element Clean (Yes/No) F-2: (DP-101) _____ i.w.	
Soil Vapor Extraction Blowers B-1A Standby (Yes / No) B-1B Standby (Yes / No)	Yes No	PI-102 _____ i.w. PI-103 _____ i.w. Blower: On / Off Blower: On / Off	
Soil Vapor Extraction Blowers Discharge Flow Meter FQIT-101	Yes No	Flow Rate: _____ cfm Flow Total: _____ cubic feet	

Site 1, Former Drum Marshalling Area
Soil Vapor Extraction Containment System
NWIRP Bethpage, NY

INSPECTION FORM

EQUIPMENT DESCRIPTION	VISUAL INSPECTION (Circle one)	SYSTEM PARAMETERS (Circle one or Fill in the blank)	COMMENTS
Soil Vapor Temperature TI-101	Yes No	Temperature _____ degrees F	
VGAC-1 Discharge Pressure	Yes No	Pressure PI-104 _____ i.w.	
Low Vacuum in inlet to M-1	Yes No	Shut-down due to PSL-101 Yes / No	
High Condensate Level in M-1	Yes No	Shut-down due to LSH-101 Yes / No	
High Pressure in Blower Discharge	Yes No	Shut-down due to PSH-101 Yes / No	
High Temperature in Blower Discharge	Yes No	Shut-down due to TSH-101 Yes / No	
SVPM-2002-S Near 242 11th St.	Yes No	Vacuum: _____ i.w. Total VOCs _____from PID/Tedlar Bag	
SVPM-2002-I Near 242 11th St.	Yes No	Vacuum: _____ i.w. Total VOCs _____from PID/Tedlar Bag	
SVPM-2002-D Near 242 11th St.	Yes No	Vacuum: _____ i.w. Total VOCs _____from PID/Tedlar Bag	
SVPM-2003-S On 11th St. Near 211 Maple	Yes No	Vacuum: _____ i.w. Total VOCs _____from PID/Tedlar Bag	
SVPM-2003-I On 11th St. Near 211 Maple	Yes No	Vacuum: _____ i.w. Total VOCs _____from PID/Tedlar Bag	
SVPM-2004-I Near 207 Sycamore Ave.	Yes No	Vacuum: _____ i.w. Total VOCs _____from PID/Tedlar Bag	
SVPM-2004-D Near 207 Sycamore Ave.	Yes No	Vacuum: _____ i.w. Total VOCs _____from PID/Tedlar Bag	
SVPM-2007-I Near 245 & 245 10th St.	Yes No	Vacuum: _____ i.w. Total VOCs _____from PID/Tedlar Bag	
SVPM-2007-D Near 245 & 245 10th St.	Yes No	Vacuum: _____ i.w. Total VOCs _____from PID/Tedlar Bag	
Inspect Grounds	Yes No	Condition Okay (Yes / No)	
Inspect Buildings	Yes No	Condition Okay (Yes / No)	
Inspect Doors	Yes No	Condition Okay (Yes / No)	
Inspect Locks	Yes No	Condition Okay (Yes / No)	
WEATHER			
General			
Temperature			
Barometric Pressure			
Wind			

A-2
Equipment Maintenance Form

Site 1, Former Drum Marshalling Area
Soil Vapor Extraction Containment System
NWIRP Bethpage, NY

EQUIPMENT MAINTENANCE FORM

EQUIPMENT IDENTIFICATION	DATE	MAINTENANCE ACTIVITY PERFORMED	COMMENTS

A-3
Collection of Condensate (Aqueous) Samples SOP 001

Sampling of Condensate (Aqueous) Samples (SOP 001)

Condensate samples will be collected from the sampling port on the bottom of the Moisture Separator Tank M-1 within the SVECS Treatment Building according to the following procedure:

1. Be aware that the condensate contains chlorinated VOCs and follow the proper health and safety guidelines as identified in the SHSP.

2. Partially open the ball valve at the sample port for a few seconds and collect the condensate in a 5-gallon bucket in order to flush out any dead zones. Close the ball valve at the sample port and empty the condensate in the bucket into a 55-gallon drum.

3. Partially open the ball valve at the sample port for a few seconds once more and collect the condensate in a dedicated clean glass beaker. Close the ball valve at the sample port and quickly transfer an appropriate volume of the sample from the beaker into the proper sample vials and bottles**. If possible, avoid use of the dedicated clean glass beaker and collect condensate samples directly from the sample port into the sample containers.**

4. Samples for VOCs must be collected first. The sample vials and bottles should be preserved and filled according to the procedures specified below and in Table 5-3 in the Final Work Plan (TtEC, October 15, 2009).

5. Fill all sample vials and bottles by allowing the condensate to flow gently down the inside of the vial or bottle with minimal turbulence. Cap each vial or bottle as it is filled.

6. Preserve and label the samples, and record them on the Chain of Custody form and in the field logbook. Place the sample vials and bottles immediately into a cooler for shipment and maintain at 4°C.

7. The filling and preservation procedures will be:

    - VOCs - Determine the amount of 1:1 HCl preservative required to adjust the pH of the sample to less than 2 in an extra 40 ml glass vial. Add this volume to the empty 40 ml vials prior to sampling. Fill each container with sample to just overflowing so that no air bubbles are entrapped inside. If effervescence occurs, submit the sample without preservative and note on the chain of custody form.

    - Other Parameters - Fill each container and preserve immediately as required. To test for pH, pour a minimal portion of sample onto broad range pH paper to verify that the appropriate pH level has been obtained.

A-4
Collection of Process Vapor Samples using Summa Canisters SOP 002

Sampling of Soil Vapor Samples using Summa Canisters (SOP 002)

Soil vapor samples will be collected in Summa Canisters from the two sampling ports in the VGAC unit within the SVECS Treatment Building according to the following procedure:

1. This procedure involves the collection of a 30-minute integrated sample using 6-liter Summa canisters supplied by the laboratory. Be aware that the nominal soil vapor flow rate through the SVECS is 600 cubic feet per minute and that the soil vapor pipelines are under pressure (up to 10 inches of water). Be aware that the soil vapor contains chlorinated VOCs and follow the proper health and safety guidelines as identified in the SHSP. Be aware that the Summa canisters and associated hardware are expensive containers that need to be handled with special care.

2. Verify the initial vacuum of the canister as received from the laboratory utilizing the following steps. Confirm that the valve on the canister is closed. Remove the brass cap from the canister and attach the critical orifice flow controller to the canister. Attach the brass cap to the other end of the flow controller. After ensuring that the ¼ inch Swagelok fittings are tight using a 9/16 inch wrench and that you have a closed leak-free train, quickly open and close the canister valve. Read the vacuum on the built-in gauge on the flow controller. The initial vacuum should be greater than 25 in of Hg. If this is not the case, do not use that canister for sampling and call the laboratory to arrange for a replacement. Record the gauge reading in the "initial vacuum" column on the Chain of Custody form.

3. Connect a purge line to the sample port making sure that the other end is vented outside the SVECS building. Partially open the ball valve at the sample port for a few seconds and allow the line to purge in order to flush out any dead zones. Close the ball valve at the sample port. Disconnect the purge line. **UNDER NO CIRCUMSTANCES SHOULD THE VAPORS FROM THE SAMPLE PORT BE VENTED INSIDE THE SVECS TREATMENT BUIDING**. Some of the chlorinated VOCs can be immediately dangerous to life and health.

4. Remove the brass cap from the flow controller and connect the sample train to the sample port. After ensuring that the ¼ inch Swagelok fittings are tight using a 9/16 inch wrench and that you have a closed leak-free train and that the canister and flow controller are properly supported, quickly open the canister valve (1/2 turn) and the ball valve on the sample port. Record sample start time.

5. Monitor the integrated sampling process periodically. After 30 minutes, record the "final vacuum" on the Chain of Custody form by reading the vacuum on the built-in gauge on the flow controller. Close the canister valve and the ball valve on the sample port. Record sample finish time.

6. Detach the sampling train from the sample port. Detach the flow controller from the

canister and replace the brass cap on the canister. Fill out the canister sample tag and log book making sure that the information matches that recorded on the Chain of Custody form. DO NOT attach any labels to the surface of the canister or write on the canister.

7. Return the canisters and the flow controllers to the laboratory in the boxes and packaging provided. Place the chain of custody form (after retaining the appropriate copies) in the box with the canister. Tape the box shut and place custody seals at each opening.

A-5
Collection of Process Vapor Samples using Tedlar Bags SOP 003

Sampling of Soil Vapor Samples using Tedlar Bags (SOP 003)

Soil vapor samples will be collected in Tedlar Bags from the 12 sampling ports for the Soil Vapor Extraction Wells (SVEWs) in the Flow Monitoring Station (FMS) according to the following procedure:

1. Verify that it is safe to enter the Flow Monitoring Station by measuring the readings in the breathing zone using a photo-ionization detector (PID). Follow the proper health and safety guidelines as identified in the SHSP.

2. This procedure involves the collection of a soil vapor sample using a low flow rate pump, Teflon tubing, Tedlar bags, and a PID. Be aware that the nominal soil vapor flow rate through the SVECS is 600 cubic feet per minute and that the soil vapor pipelines in the FMS are under vacuum (up to 20 inches of water). Be aware that the soil vapor contains chlorinated VOCs and follow the proper health and safety guidelines as identified in the SHSP.

3. Read the vacuum on the vacuum gauge for the individual SVEW on the influent line from the well to the manifold in the FMS. Record the gauge reading in the log book.

4. Attach new Teflon tubing from the low flow rate pump inlet to the sample port for the individual SVEW making sure that the pump discharge is vented outside the FMS. Open the ball valve at the sample port and turn on the pump for one minute and allow the line and tubing to purge in order to flush out any dead zones. Close the ball valve at the sample port. **UNDER NO CIRCUMSTANCES SHOULD THE VAPORS FROM THE SAMPLE PORT BE VENTED INSIDE THE FMS**. Some of the chlorinated VOCs can be immediately dangerous to life and health.

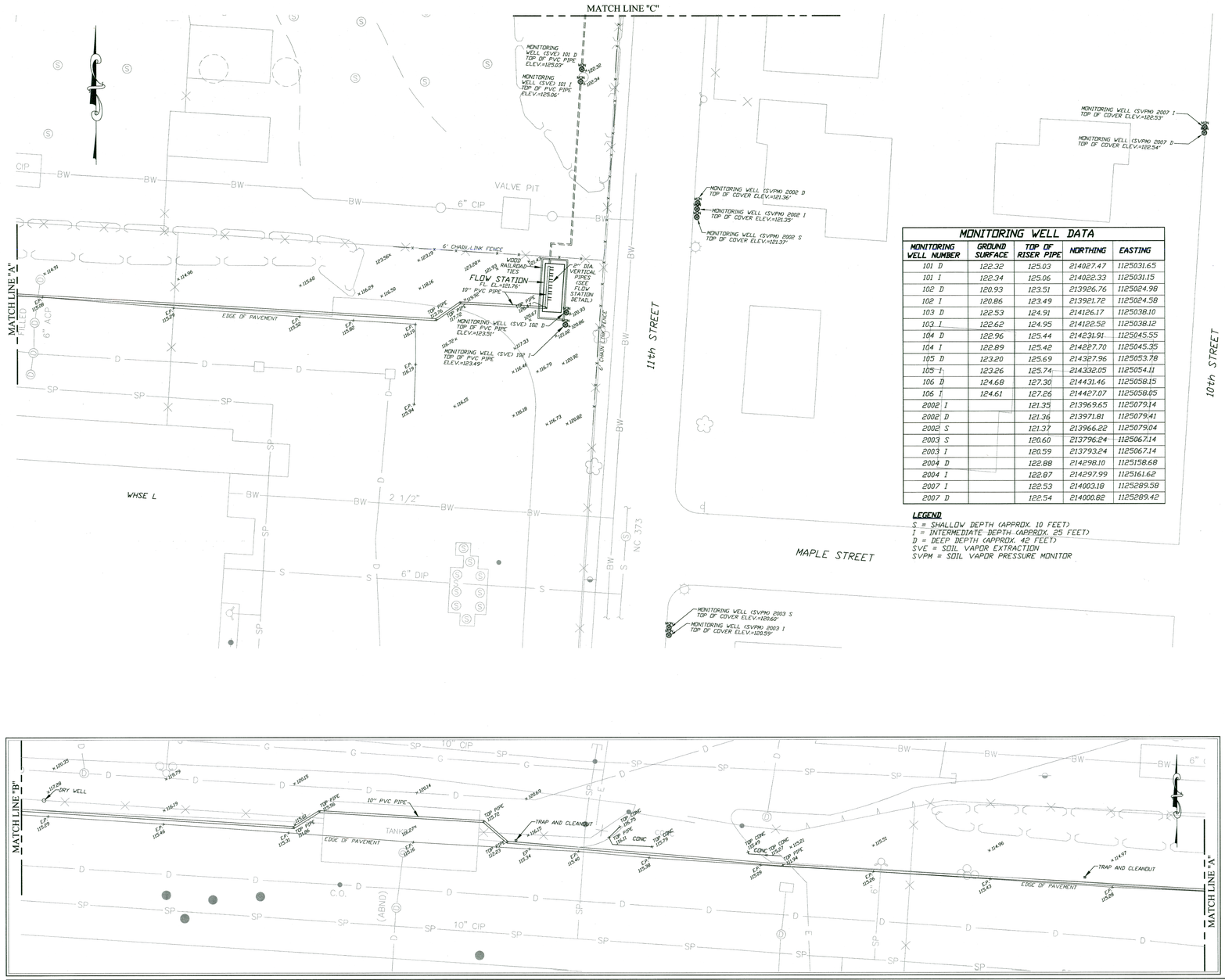
5. Fill out the sample tag on the Tedlar bag.

6. Attach new Teflon tubing from the low flow rate pump discharge to the Tedlar bag valve. Open the ball valve at the sample port and the Tedlar bag valve. Record sample start time. Turn on the pump for as long as it takes to partially fill the Tedlar bag. (FILL NO MORE THAN 2/3 FULL).

7. Close the Tedlar bag valve and the ball valve at the sample port and turn off the pump. Record sample finish time. Fill out the log book making sure that the information matches that recorded on the sample tag on the Tedlar bag. Detach the Tedlar bag from the pump and attach it to the probe of the PID. Open the Tedlar bag valve. Record the reading in the log book.

8. Repeat the procedure using new Teflon tubing for each of the 12 individual SVEWs.

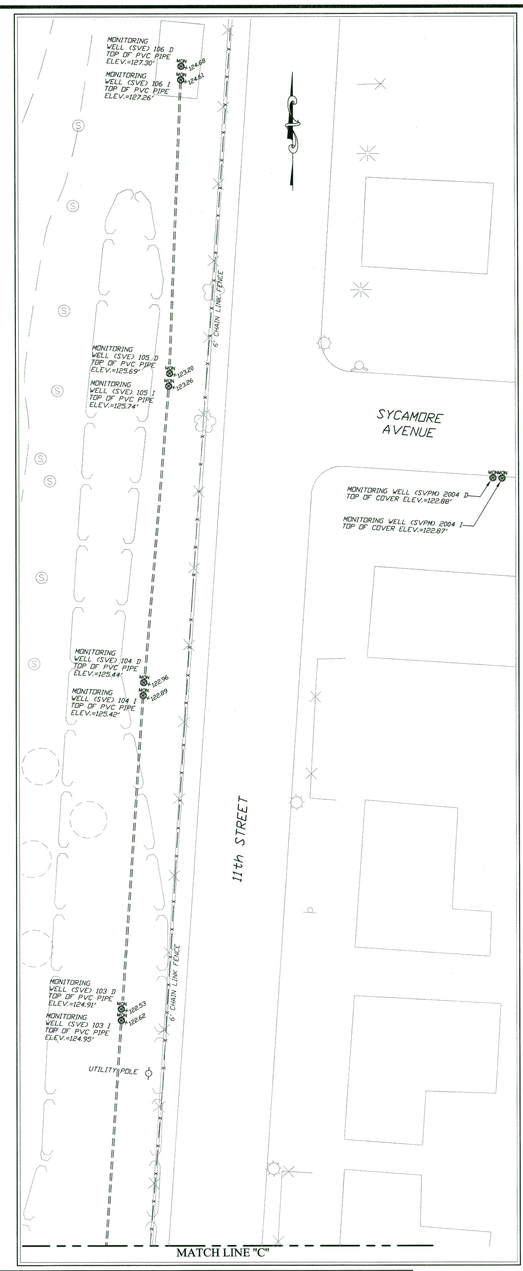
A-6
SVECS Record Drawings



MONITORING WELL DATA

MONITORING WELL NUMBER	GROUND SURFACE	TOP OF RISER PIPE	NORTHING	EASTING
101 D	122.32	125.03	214027.47	1125031.65
101 I	122.34	125.06	214022.33	1125031.15
102 D	120.93	123.51	213926.76	1125024.98
102 I	120.86	123.49	213921.72	1125024.58
103 D	122.53	124.91	214126.17	1125038.10
103 I	122.62	124.95	214122.52	1125038.12
104 D	122.96	125.44	214231.91	1125045.55
104 I	122.89	125.42	214227.70	1125045.35
105 D	123.20	125.69	214327.96	1125053.78
105 I	123.26	125.74	214332.05	1125054.11
106 D	124.68	127.30	214431.46	1125058.15
106 I	124.61	127.26	214427.07	1125058.05
2002 I		121.35	213969.65	1125079.14
2002 D		121.36	213971.81	1125079.41
2002 S		121.37	213966.22	1125079.04
2003 S		120.60	213796.24	1125067.14
2003 I		120.59	213793.24	1125067.14
2004 D		122.88	214298.10	1125158.68
2004 I		122.87	214297.99	1125161.62
2007 I		122.53	214003.18	1125289.58
2007 D		122.54	214000.82	1125289.42

LEGEND
S = SHALLOW DEPTH (APPROX. 10 FEET)
I = INTERMEDIATE DEPTH (APPROX. 25 FEET)
D = DEEP DEPTH (APPROX. 42 FEET)
SVE = SOIL VAPOR EXTRACTION
SVPM = SOIL VAPOR PRESSURE MONITOR



AS-BUILT SURVEY
OF
SITE 1
SOIL VAPOR EXTRACTION CONTAINMENT SYSTEM
FOR
THE NAVAL FACILITIES ENGINEERING COMMAND, MID-ATLANTIC

LOCATED AT

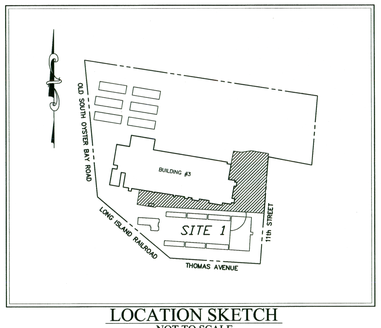
NWIRP BETHPAGE

TOWN OF OYSTER BAY
NASSAU COUNTY, NEW YORK
DECEMBER 17, 2009

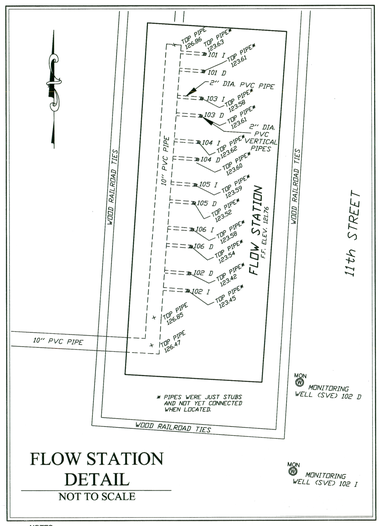
GRAPHIC SCALE

20 0 10 20 40 80

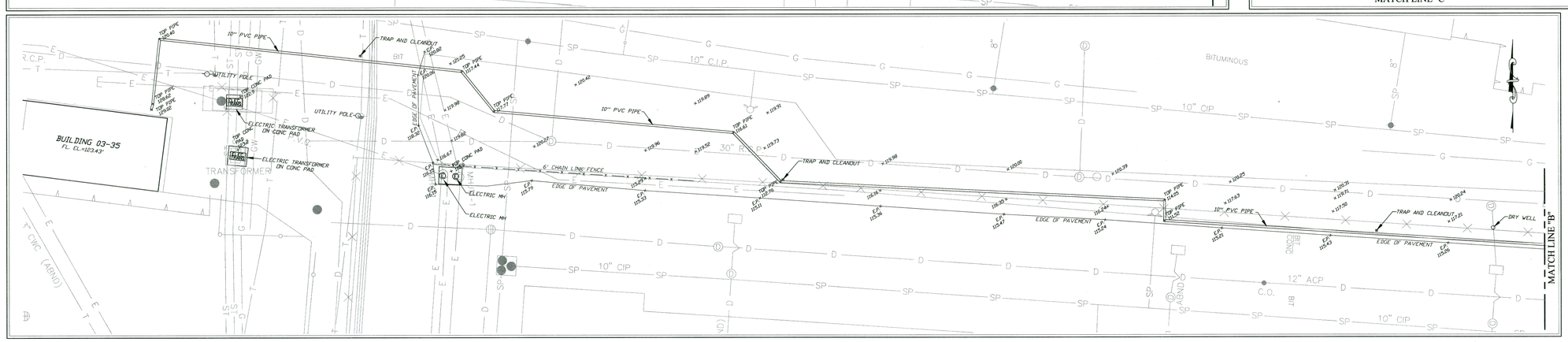
(IN FEET)
1 inch = 20 ft.



LOCATION SKETCH
NOT TO SCALE



FLOW STATION DETAIL
NOT TO SCALE



I hereby certify that this map was made from an actual survey completed by me on 12/14/2009

ROY R. FULKERSON, P.L.S.
NYSPLS No. 49500

NOTES

1. *MEASUREMENTS ARE IN ACCORDANCE WITH U.S. STANDARDS.*
2. *HORIZONTAL DATUM IS IN THE LONG ISLAND ZONE OF THE NEW YORK STATE PLANE COORDINATE SYSTEM NAD 1983.*
3. *VERTICAL DATUM REFERS TO NAVD 88.*
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7. *RIGHTS-OF-WAY NOT SHOWN ARE NOT CERTIFIED.*

DATE	BY	DESCRIPTION	APPROV. BY
3-29-2010	TLS	CORRECTED MONITORING WELL TABLE	RRF
3-17-2010	TLS	FINAL REVISIONS PER REVIEW	RRF

REVISIONS

LKAA

Town of Oyster Bay
Nassau County, New York

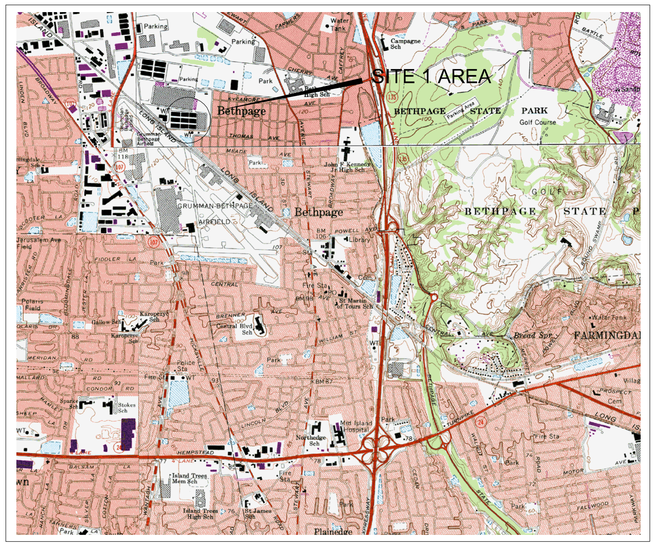
NAVAL WEAPONS INDUSTRIAL RESERVE PLANT SITE 1

AS-BUILT SURVEY

L. K. McLEAN ASSOCIATES, P.C.
CONSULTING ENGINEERS
437 SO. COUNTRY ROAD, BROOKHAVEN, NEW YORK

STATE OF NEW YORK · ROY R. FULKERSON · No. 049500 · LICENSED LAND SURVEYOR

Designed By:	KG/BL	Scale:	1"= 20'	Sheet No.
Drawn By:	MA	Date:	December 17, 2009	1
Approved By:	RRF	File No.	04033.001	of 1



NWIRP BETHPAGE VICINITY MAP

0 2,000 4,000

SCALE IN FEET

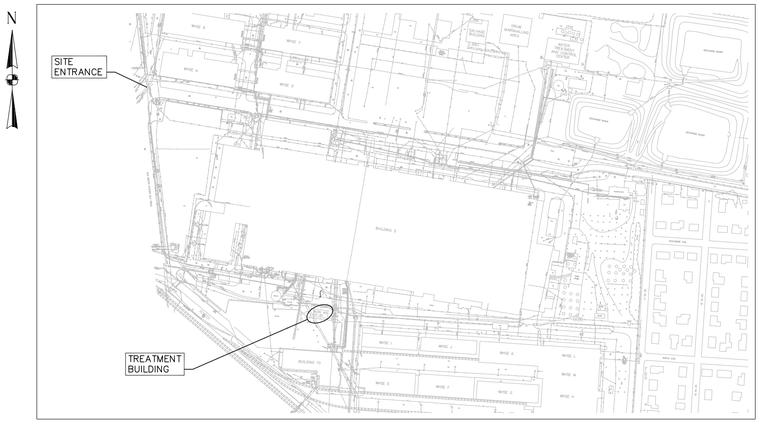
DESIGN-BUILD CONSTRUCTION FOR INTERIM REMEDIAL ACTION

FINAL RECORD DRAWINGS

SITE 1 AREA
NAVAL WEAPONS INDUSTRIAL RESERVE PLANT

BETHPAGE, NEW YORK

CONTRACT No. N62473-10-D-3211
CONTRACT TASK ORDER No. WE04



WORK AREA

0 300 600

SCALE IN FEET

DRAWING INDEX

T-1 TITLE SHEET

C-1 EXISTING CONDITIONS
C-2 SITE PLAN (1 OF 2)
C-3 SITE PLANT (2 OF 2)
C-4 MISCELLANEOUS SECTIONS AND DETAILS
C-5 WELL SECTIONS AND DETAILS

P-1 PIPING AND INSTRUMENTATION LEGEND
P-2 PIPING AND INSTRUMENTATION DIAGRAM
P-3 PROCESS EQUIPMENT LAYOUT AND DETAILS

M-1 FLOW MONITORING STATION PIPING ARRANGEMENT
M-2 TREATMENT BUILDING GENERAL PIPING LAYOUT
M-3 HEATING AND VENTILATION LAYOUT AND DETAILS

E-1 ELECTRICAL LEGEND AND GENERAL NOTES
E-2 ELECTRICAL SINGLE LINE AND PANEL DIAGRAMS
E-3 ELECTRICAL POWER AND INSTRUMENT PLAN
E-4 LIGHTING LAYOUT
E-5 FIRE ALARM PLAN

REV	DESCRIPTION	PREP BY	DATE	APPRVD
0	ISSUED FOR CONSTRUCTION	DLB	10-14-09	SGP
1	RECORD DRAWING	DB	6-2-10	GPK

TETRA TECH ENGINEERING CORPORATION PC

DSGN: RAH DR: RMV CH: ENG CHK: SP

SUBMITTED BY: (FIRM NUMBER) (TITLE) (DATE)

SOUTHWESTERN DIV. FPC OFFICER IN CHARGE

APPROVED DATE

NAVAL FACILITIES ENGINEERING COMMAND, MID-ATLANTIC

DEPARTMENT OF THE NAVY

NAVAL FACILITIES ENGINEERING COMMAND, MID-ATLANTIC

NAVAL WEAPONS INDUSTRIAL RESERVE PLANT BETHPAGE, NEW YORK

SITE 1, FORMER DRUM MARSHALLING AREA
SOIL VAPOR EXTRACTION CONTAINMENT SYSTEM
TITLE SHEET

APPROVED DATE

EFANE FOR COMMANDER, NAVFAC

SEAL

STATE OF NEW YORK GEOFFREY P. KING 080339 REGISTERED PROFESSIONAL ENGINEER

GEOFFREY P. KING, P.E.
NYPE NO. 080339-1
EXPIRATION DATE 6/30/2011

SAT TO DATE

CODE I.D. NO.

SCALE : AS SHOWN

SPEC. NO.

CONSTRN. CONTR. NO. N62473-10-D-3211

NAVFAC DRAWING NO.

SHEET OF

SIZE: D DIS. SH. NO. T-1

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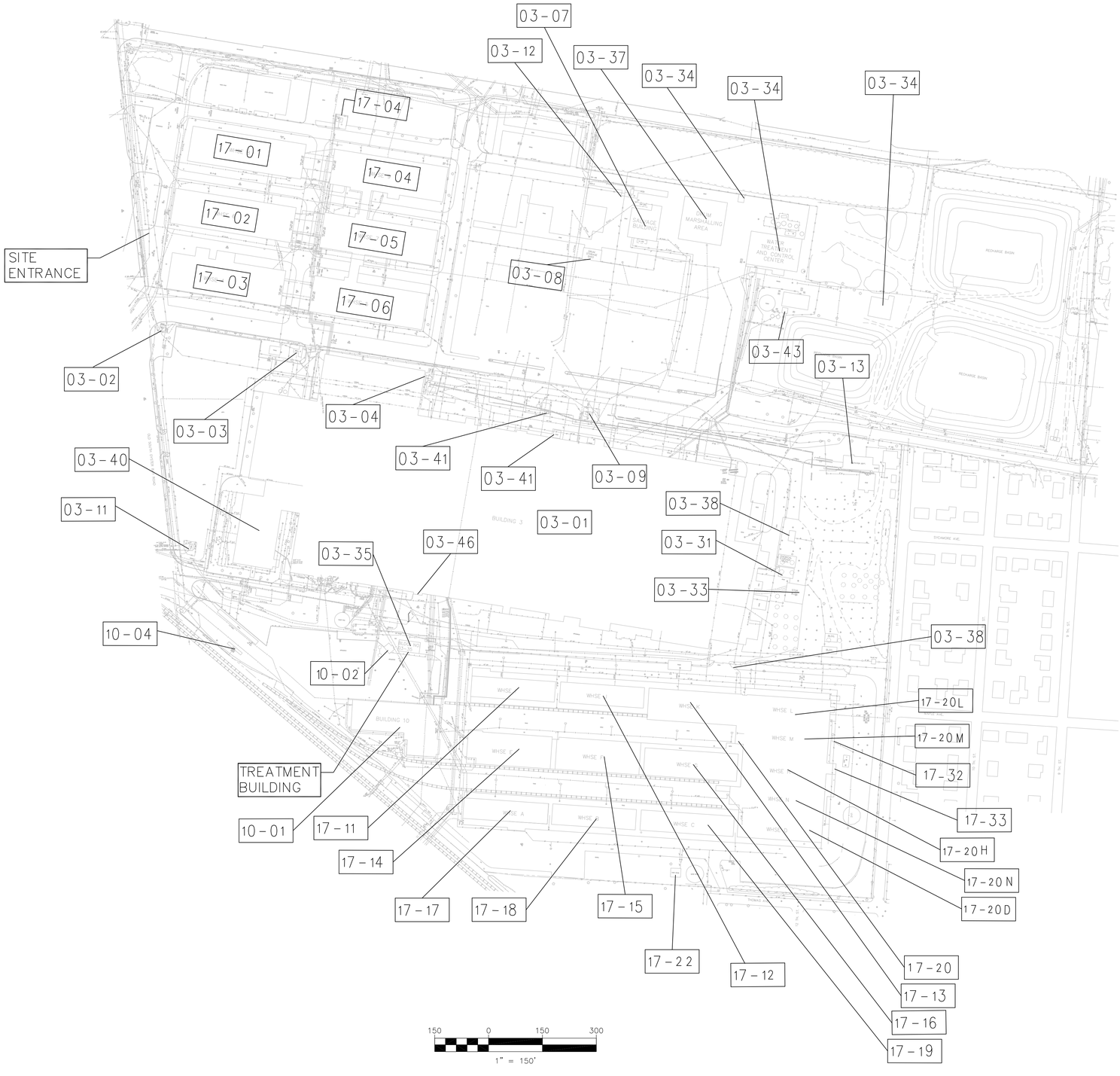

REVISION					
REV	DESCRIPTION	APPROVED ENGG	ENVIR	ENERGY	DATE
1	DELETED ABANDONED BLDG NUMBERS	RA			03/18/92
2	ADDED TBG COGEN-COMBINED CYCLE PLT AND AERATION BASIN	RA			06/15/92
3	REMOVED BLDG 04-84 TRAILERS	RA			/06/92
4	REMOVED BLDGS 12-10 & 105-01	RA			/22/92
5	UPDATE SITE PLAN SURVEY	JWG			/25/98
6	UPDATE SITE PLAN SURVEY	JWG			/15/98
7	UPDATE SITE PLAN SURVEY	JWG			/05/98
8	UPDATE SITE PLAN SURVEY	JWG			/19/96
9	UPDATE SITE PLAN SURVEY	JWG			/17/96
10	UPDATE SITE PLAN SURVEY	JWG			/07/96
11	UPDATE SITE PLAN SURVEY	JWG			/14/98
12	UPDATE SITE PLAN SURVEY	JWG			/24/97
13	UPDATE SITE PLAN SURVEY	JNS			/13/98
14	UPDATE SITE PLAN SURVEY	JNS			/30/98

LIST OF UTILITES:

NEW YORK CITY ONE-CALL CENTER
(800) 272-4480

BETHPAGE WATER DISTRICT
25 ADAMS AVE.
BETHPAGE, NY 11714
(516) 931-0093

CABLEVISION
(516) 393-3295

COUNTY OF NASSAU
DEPARTMENT OF PUBLIC WORKS
[SANITARY SEWER]
1550 FRANKLIN AVENUE
MINEOLA, NY 11501-4822
(516) 571-7319, 20

KEYSPAN ENERGY [GAS]
175 EAST OLD COUNTRY ROAD
HICKSVILLE, NY 11801
(800) 272-4480
(631) 567-7800 (LOCATIONS SERVICE)

LONG ISLAND POWER AUTHORITY (LIPA)
[ELECTRIC]
175 EAST OLD COUNTRY ROAD
HICKSVILLE, NY 11801
(800) 272-4480
(631) 567-7800 (LOCATIONS SERVICE)

MCI
(800) 840-0338

TOWN OF OYSTER BAY
DEPARTMENT OF PUBLIC WORKS
[STREETS AND STORM SEWER]
SYOSSET, NY 11791-5699
(516) 677-5935

VERIZON
(718) 471-4206

NAVY FACILTIY MANAGER
AL TAORMINA, ECOR SOLUTIONS
(516) 346-0344

REFERENCE:

NORTHROP GRUMMAN
DRAWING SOURCE NAVY PARCEL 8/6/98

NOTES:

1. THE SOIL VAPOR EXTRACTION CONTAINMENT SYSTEM WAS INSTALLED INSIDE BUILDING NO. 03-35
2. CONFIRMATION OF COMPLETED DIG SAFE NOTIFICATION WAS PROVIDED TO TETRA TECH PRIOR TO ANY INTRUSIVE ACTIVITIES.

BLDG NO.	DESCRIPTION	NAVY BLDG NO.
003-01	MANUFACTURING	3
003-02	WELL HOUSE #8	43
003-03	WELL HOUSE #9	42
003-04	WELL HOUSE #10	44
003-07	SALVAGE BLDG	21
003-08	SALVAGE YARD	22
003-09	WELL HOUSE #11	45
003-11	WELL HOUSE #14	46
003-12	WELL HOUSE #15	128
003-13	SANITATION OFFICE	34
003-24	GUARD BOOTH *	
003-31	BOTTLE GAS STORAGE	130
003-33	TRANSPORTATION BLDG	
003-34	INDUSTRIAL WASTE TREATMENT FAC	133
003-35	MAINTENANCE BLDG	
003-37	DRUM STORAGE PAD	
003-38	STORAGE BLDG	
003-40	GAC PROM	
003-41	STORAGE SHED	
003-43	STORAGE BLDG	
003-46	STORAGE BLDG	
003-49	SAND SHED	
003-52	WELLWATER TREATMENT BLDG	
003-50	ALUMINUM SHED	
010-01	LABORATORY	10
010-02	STORAGE BLDG	
010-04	SCALE HOUSE	31
017-01	WAREHOUSE 8	8
017-02	WAREHOUSE 6	6
017-03	WAREHOUSE 4	4
017-04	WAREHOUSE 9 & INTERCONNECT	9
017-05	WAREHOUSE 7 & INTERCONNECT	7
017-06	WAREHOUSE 5 & INTERCONNECT	5
017-09	WELL HOUSE	13
017-11	WAREHOUSE 3I	17
017-12	WAREHOUSE 3J	18
017-13	WAREHOUSE 3K	19
017-14	WAREHOUSE 2E	14
017-15	WAREHOUSE 2F	15
017-16	WAREHOUSE 2G	16
017-17	WAREHOUSE 1A	11
017-18	WAREHOUSE 1B	12
017-19	WAREHOUSE 1C	13
017-20D	WAREHOUSE D	20
017-20H	WAREHOUSE H	20
017-20L	WAREHOUSE L	20
017-20M	WAREHOUSE M	20
017-20N	WAREHOUSE N	20
017-22	PUMP HOUSE	26
017-25	STORAGE SHED	
017-32	BOILER HOUSE	
017-33	BOILER HOUSE	
017-36	WATER LIFT STATION	47
017-37	#306123 DRUM STORAGE SHED	

* = NOT DESIGNATED IN SQUARE FOOTAGE REPORTS

TETRA TECH ENGINEERING CORPORATION PC

REV	DESCRIPTION	PREP BY	DATE	APPRVD
0	ISSUED FOR CONSTRUCTION	DLB	10-14-09	SGP
1	RECORD DRAWING	DB	5-28-10	JAV

DES. INF. | DRWN. BWY | CH. ENG. | CHK. SP | SUBMITTED BY: (TRM MEMBER) (TITLE) (DATE) | NORTHDIV DIR. | HD. | OIC | PPE. | OFFICER IN CHARGE | APPROVED | DATE

DEPARTMENT OF THE NAVY
NAVAL FACILITIES ENGINEERING COMMAND, MID-ATLANTIC
NAVAL WEAPONS INDUSTRIAL RESERVE PLANT BETHPAGE, NEW YORK
SITE 1, FORMER DRUM MARSHALLING AREA
SOIL VAPOR EXTRACTION CONTAINMENT SYSTEM
EXISTING CONDITIONS
NAVAL FACILITIES ENGINEERING COMMAND
EFANE FOR COMMANDER, NAVFAC
DATE
APPROVED

SEAL AREA

STATE OF NEW YORK · ABRAHAM VARUGHESE · 087171 · LICENSED PROFESSIONAL ENGINEER

JEBBY ABRAHAM VARUGHESE P.E.
NYPE NO. 087171
EXPIRATION DATE 6/30/2012

SAT TO DATE

CODE I.D. NO.
SCALE : AS SHOWN
SPEC. NO.
CONSTRN. CONTR. NO.
N62473-10-D-3211
NAVFAC DRAWING NO.

SHEET OF
SIZE: D
DIS. SH. NO. C-1

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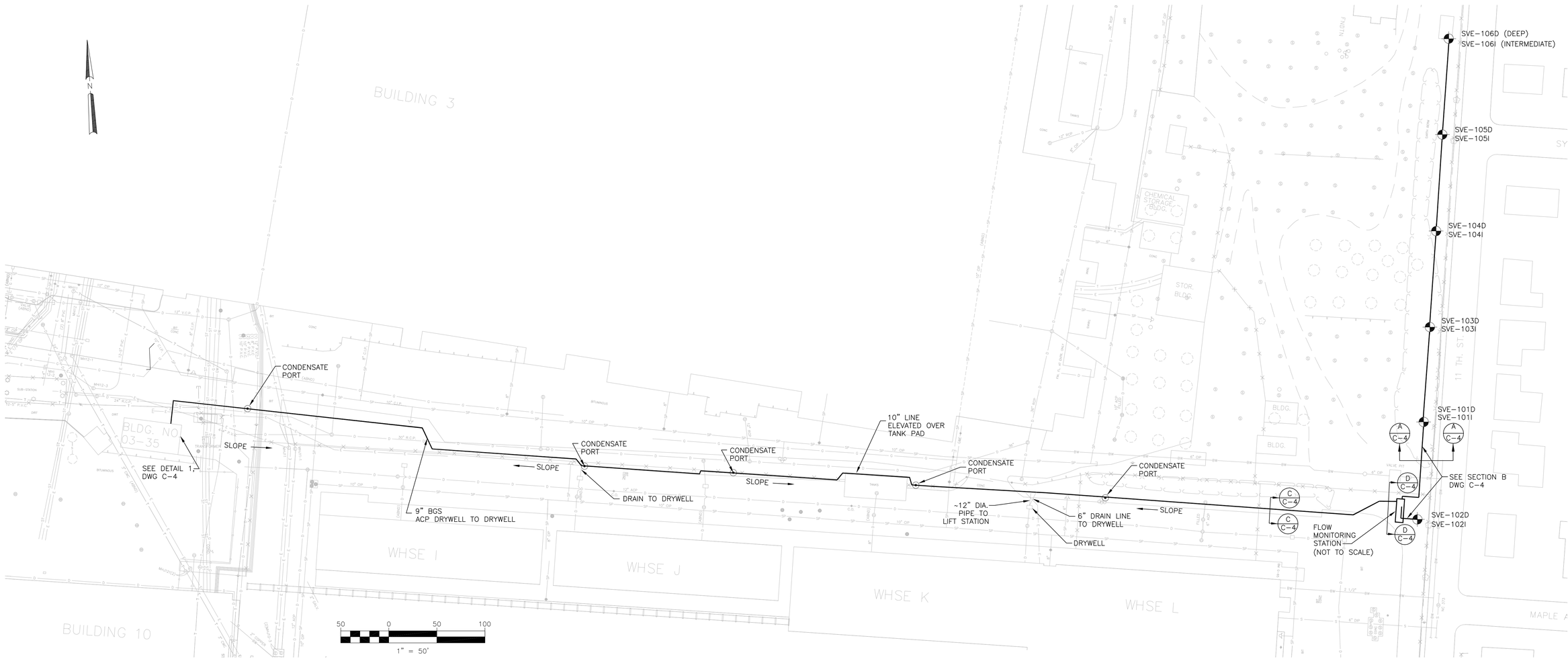

LEGEND:

- SOIL VAPOR EXTRACTION WELLS
- CONDENSATE CLEAN-OUT PORT
- HYDRANT
- FENCE
- EXTRACTION PIPE TRENCH
- STORM DRAIN MANHOLE

ABBREVIATIONS:

SD	STORM DRAIN
BW	BETHPAGE WATER (POTABLE)
E	ELECTRICAL
G	GAS
GW	WELL WATER (ABANDONED)
SP	SPRINKLER LINE
ST	STEAM
T	TELEPHONE
ACP	ASBESTOS CONCRETE PIPE
BIT	BITUMINOUS (ASPHALT)
CIP	CAST IRON PIPE
CONC	CONCRETE
GALV	GALVANIZED
RCP	REINFORCED CONCRETE PIPE
ABND	ABANDONED
BGS	BELOW GROUND SURFACE

NOTES:

1. ACTUAL SURVEYED AS-BUILT CONDITIONS INCLUDING SOIL VAPOR EXTRACTION WELL AND SOIL VAPOR PRESSURE MONITOR POINT LOCATIONS ARE SHOWN ON "AS-BUILT SURVEY OF SITE 1 SOIL VAPOR EXTRACTION CONTAINMENT SYSTEM" REVISION MARCH 29, 2010 BY L. K. MCLEAN ASSOCIATES, P.C.
2. FOR WELL DETAILS, SEE DRAWING NO. C-5.
3. SEE DETAIL NO. 9 ON DRAWING NO. C-5 FOR CONDENSATE CLEAN-OUT PORT DETAILS.
4. A TOTAL OF TWELVE SVE WELLS ARE USED FOR VAPOR EXTRACTION. THE SVE WELLS WERE SCREENED AT INTERMEDIATE DEPTHS (25-30 FT) AND DEEP DEPTHS (40-60 FT). SEE DETAIL NOS. 4 AND 5 ON DRAWING NO. C-5 FOR SVE WELL DETAILS.

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DEPARTMENT OF THE NAVY
NAVAL FACILITIES ENGINEERING COMMAND, MID-ATLANTIC
NAVAL WEAPONS INDUSTRIAL RESERVE PLANT
BETHPAGE, NEW YORK

SITE 1, FORMER DRUM MARSHALLING AREA
SOIL VAPOR EXTRACTION CONTAINMENT SYSTEM
SITE PLAN (1 OF 2)

APPROVED
DATE
EFANE FOR COMMANDER, NAVFAC

SEAL AREA

STATE OF NEW YORK · JEBBY ABRAHAM VARUGHESE · LICENSED PROFESSIONAL ENGINEER · 087171

JEBBY ABRAHAM VARUGHESE, P.E.
NYPE NO. 087171
EXPIRATION DATE 6/30/2012

SAT TO DATE

CODE I.D. NO.
SCALE : AS SHOWN
SPEC. NO.
CONSTRN. CONTR. NO. N62473-10-D-3211
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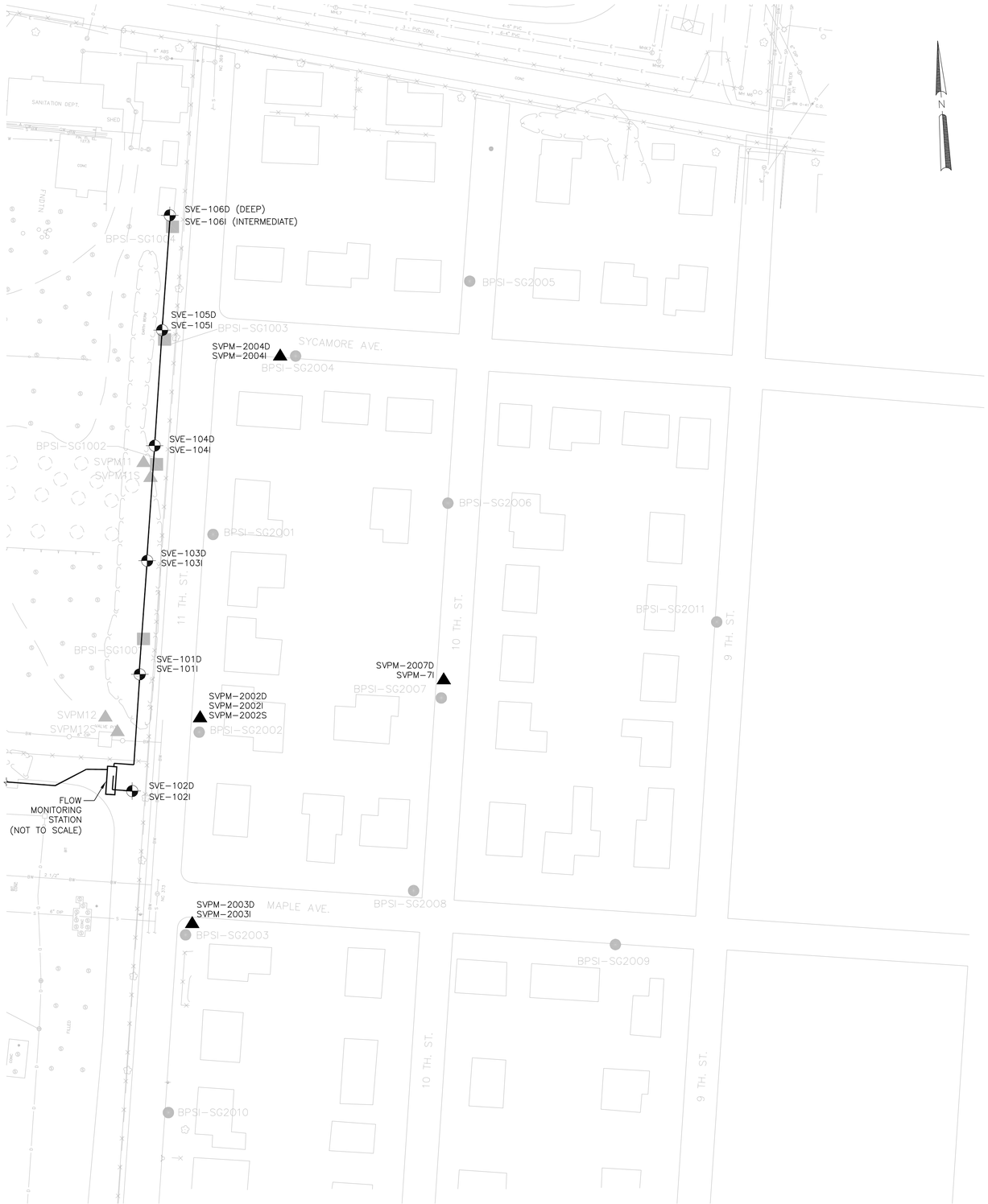
DIS. SH. NO. C-2



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4. A TOTAL OF NINE SOIL VAPOR PRESSURE MONITORS ARE USED TO MEASURE TREATMENT SYSTEM VACUUMS. SVPM-2004I AND SVPM-2004D WERE INSTALLED DURING CONSTRUCTION PHASE. SOIL VAPOR PRESSURE MONITORS SVPM-2002S, I & D, SVPM-2003S & I AND SVPM-2007I & D WERE EXISTING BUT WERE REDEVELOPED BY REMOVING FILLED SAND (NO. 2) AND INSTALLATION OF PERMANENT FLUSH MOUNT CASING. SEE DETAIL NOS. 6, 7 AND 8 ON DRAWING NO. C-5 FOR SVPM DETAILS.

LEGEND

- OFFSITE SOIL GAS SAMPLE LOCATION
- ONSITE SOIL GAS SAMPLE LOCATION
- SOIL VAPOR PRESSURE MONITORING POINTS (SVPM)
- FENCE LINE
- PROPERTY LINE
- SOIL VAPOR EXTRACTION WELLS
- EXTRACTION PIPE TRENCH

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DEPARTMENT OF THE NAVY — NAVAL FACILITIES ENGINEERING COMMAND

NAVAL FACILITIES ENGINEERING COMMAND, MID-ATLANTIC

NAVAL WEAPONS INDUSTRIAL RESERVE PLANT — BETHPAGE, NEW YORK

SITE 1, FORMER DRUM MARSHALLING AREA
SOIL VAPOR EXTRACTION CONTAINMENT SYSTEM
SITE PLAN (2 OF 2)

APPROVED DATE EFANE FOR COMMANDER, NAVFAC

SEAL AREA

STATE OF NEW YORK — JEBBY ABRAHAM VARUGHESE — 087171 — LICENSED PROFESSIONAL ENGINEER

JEBBY ABRAHAM VARUGHESE, P.E.
NYPE NO. 087171
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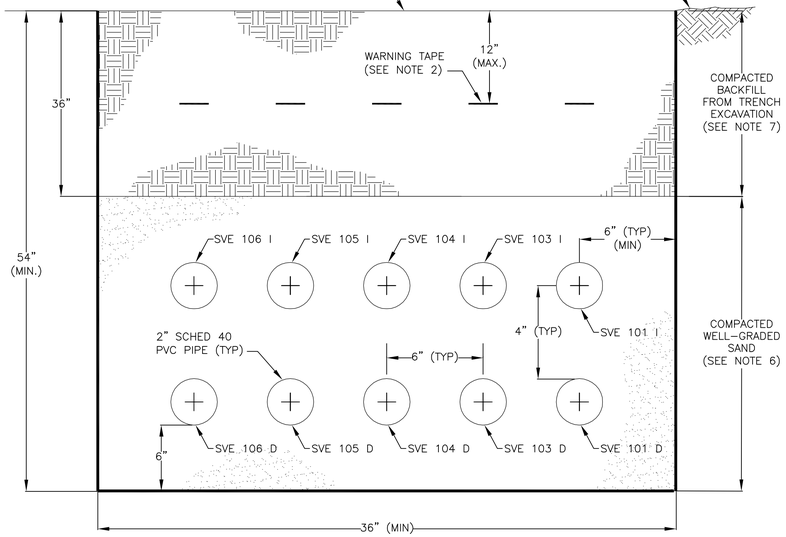
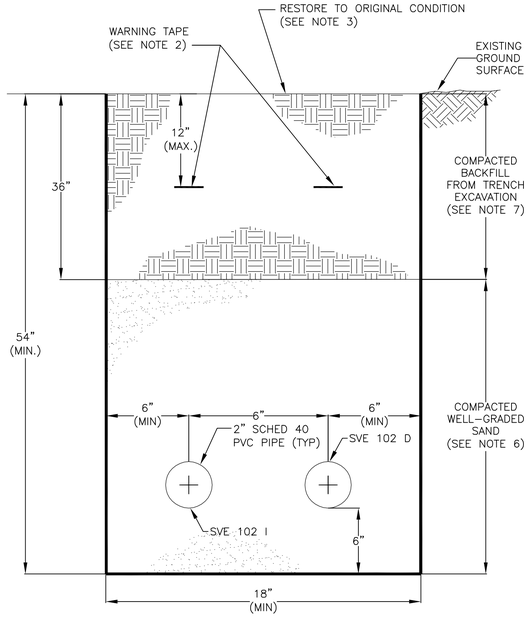


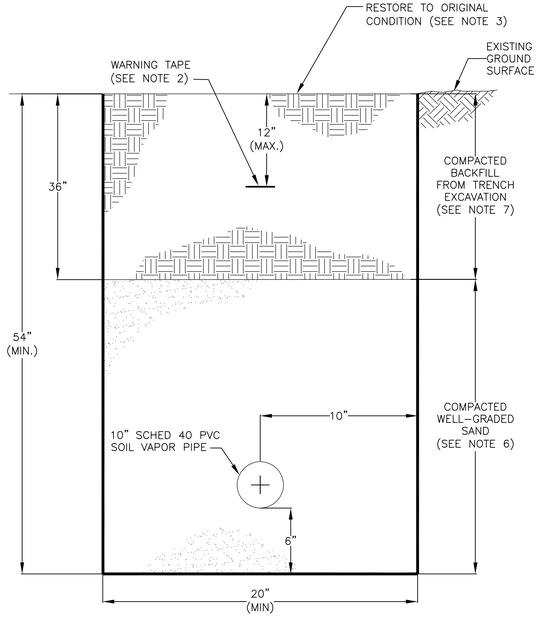
SECTION A (N.T.S.) C-4 — EXTRACTION PIPING FROM WELLS SVE 101, 103, 104, 105, 106

SEE NOTE 12



SECTION B (N.T.S.) C-4 — EXTRACTION PIPING FROM WELLS SVE 102

SEE NOTE 12

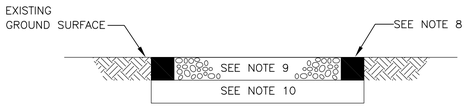


SECTION C (N.T.S.) C-4 — SOIL VAPOR PIPE TO TREATMENT BUILDING

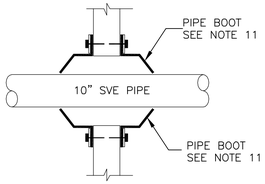
SEE NOTE 13

NOTES:

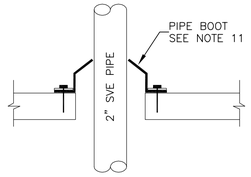
1. FOR MULTIPLE PIPELINES PLACED IN THE SAME TRENCH, PIPES SPACED AT LEAST 6 INCHES APART AS MEASURED FROM CENTERLINE OF PIPE.
2. WARNING TAPE CONSISTED OF A SOLID ALUMINUM CORE, A COATED IMPRINT, AND A REINFORCED PROTECTIVE PLASTIC JACKET BONDED TO THE FOIL CORE. MINIMUM WIDTH WAS 6" AND THE MINIMUM THICKNESS WAS 4.5 MILS.
3. CONTRACTOR PLACED A MINIMUM OF 6 INCHES OF COMPACTED EXISTING SOIL OVER THE PIPE TRENCH EXCEPT WHERE PAVEMENT WAS LOCATED. CROWNED EXISTING SOIL APPROXIMATELY 1 INCH ABOVE EXISTING GROUND TO ALLOW FOR SETTLEMENT. EXISTING PAVEMENT AND CONCRETE REMOVED DURING CONSTRUCTION WAS REPLACED IN KIND.
4. FOR UTILITY CONTACT INFORMATION, SEE DRAWING C-1.
5. EXCAVATED CONCRETE, ASPHALT, AND ANY OTHER UNSUITABLE MATERIAL FROM THE TRENCH WAS DISPOSED OFF-SITE.
6. THE WELL-GRADED SAND WAS IMPORTED, CLASSIFIED AS SW IN ACCORDANCE WITH THE UNIFIED SOIL CLASSIFICATION SYSTEM.
7. THE COMPACTED BACKFILL FROM TRENCH EXCAVATION WAS SUITABLE MATERIAL WITH A MAXIMUM SIZE LESS THAN 3 INCHES AND NOT MORE THAN 2 INCHES.
8. PLACED 6"x6" (NOMINAL) PRESSURE TREATED LUMBER AT PERIMETER OF GRAVEL BED.
9. PLACED 6" (NOMINAL) OF CLEAN NY STATE #2 GRAVEL. GRAVEL EXTENDED 2.0 FT BEYOND BUILDING WALLS IN EACH DIRECTION.
10. EXCAVATED TO A MINIMUM DEPTH OF 1.0 FT BELOW EXISTING GROUND SURFACE. SCARIFIED AND RECOMPACTED EXCAVATED SOIL IN 6" LOOSE LIFTS TO REQUIRED ELEVATION. COMPACTED TO A MINIMUM OF 95% RELATIVE COMPACTION WITH RESPECT TO THE MAXIMUM DRY DENSITY AS DETERMINED BY ASTM D698.
11. PIPE BOOTS WERE MECHANICALLY SECURED TO BUILDING FLOOR.
12. EXTRACTION PIPELINE SLOPES TOWARDS WELL LOCATIONS AT 0.1%(MIN).
13. SOIL VAPOR TRANSFER PIPELINE BETWEEN MONITORING STATION AND TREATMENT BUILDING TO HAS 0.1%(MIN) SLOPE TOWARDS CONDENSATE CLEAN-OUT PORTS.
14. PIPE ABOVE GROUND, OUTSIDE WAS INSULATED.



SECTION D (N.T.S.) C-4 — GRAVEL BASE FOR FLOW MONITORING STATION



DETAIL 1 (N.T.S.) — 10" PVC PIPE PENETRATION THRU TREATMENT BUILDING WALL



DETAIL 2 (N.T.S.) — 2" PVC PIPE PENETRATION THRU FLOW MONITORING STATION FLOOR

EROSION AND SEDIMENT CONTROL NOTES:

1. TEMPORARY EROSION CONTROL DEVICES WERE INSTALLED AS SOON AS PRACTICABLE AND APPROPRIATE. EROSION CONTROL DEVICES WERE INSTALLED PRIOR TO ANY EXCAVATION OR FILLING OPERATIONS AND INSTALLATION OF PROPOSED STRUCTURES OR UTILITIES. THEY REMAINED IN PLACE UNTIL CONSTRUCTION WAS COMPLETED AND THE AREA WAS STABILIZED. ADDITIONALLY, NO SITE PREPARATION WORK WAS UNDERTAKEN UNTIL ALL REQUIRED EROSION CONTROL MEASURES WERE INSTALLED.
2. SILTATION PREVENTION MEASURES, SUCH AS SILT FENCING AND HAY BALES, WERE INSTALLED AND MAINTAINED THROUGHOUT THE DURATION OF THE PROJECT, TO PREVENT MOVEMENT OF SILT FROM THE SITE AND INTO ANY CATCH BASIN, WATERCOURSE, STREAM, WATER BODY, OR WETLAND. THEY REMAINED IN PLACE UNTIL CONSTRUCTION WAS COMPLETED AND THE AREA WAS STABILIZED.
3. ALL DISTURBED AREAS WHERE SOIL WAS TEMPORARILY EXPOSED OR STOCKPILED FOR LONGER THAN ONE DAY WERE CONTAINED BY A CONTINUOUS LINE OF STAKED HAY BALES PLACED AROUND THE STOCKPILE. TARPS WERE AUTHORIZED TO SUPPLEMENT THESES APPROVED METHODS. EXCESS SOILS WERE SPREAD AT LOCATIONS DESIGNATED BY TETRA TECH SITE SUPERINTENDENT.
4. ALL AREAS OF SOIL DISTURBANCE RESULTING FROM THIS PROJECT WERE STABILIZED IMMEDIATELY. ALL TRENCHES WERE BACKFILLED AS SOON AS PRACTICAL. (TRENCHES WERE NOT LEFT OPEN FOR LONG DURATIONS. NO STORMWATER WAS ALLOWED TO ACCUMULATE OR ENTER INTO THE TRENCHES.
5. WASTE WATERS FROM CONSTRUCTION OPERATIONS WERE NOT PERMITTED TO ENTER THE EXISTING STORM SYSTEMS.
6. ALL VEHICLES EXITING THE WORK AREA PASSED THROUGH A TIRE WASH/DECONTAMINATION ZONE, WHERE VISIBLE DIRT WAS REMOVED FROM THE TIRES AND OTHER PARTS OF THE VEHICLE AS NECESSARY.
7. THE CONTROL MEASURES USED DURING THE PROJECT ARE SUMMARIZED BELOW:
   a. SILT FENCE: SILT FENCE INSTALLED ALONG EARTH DISTURBANCES WHICH HAD THE POTENTIAL TO ERODE AND CREATE SILTATION.
   b. HAY BALES: HAY BALES INSTALLED AROUND SOIL STOCKPILES TO PREVENT SEDIMENTS FROM LEAVING THE STOCKPILE AREA.
   c. MULCHING: MULCHING USED AS A TEMPORARY EROSION CONTROL MEASURE IN AREAS OF DISTURBANCES.
   d. DIVERSION BERMS: DIVERSION BERMS INTERCEPTED AND DIVERTED RUNOFF WATER IN PROPER MANNER, HENCE DIVERTING THE RUNOFF AWAY FROM DISTURBED AREAS/TRENCHES.
8. EROSION AND SEDIMENT CONTROL DEVICES WERE IN PLACE AT THE END OF EACH WORKING DAY. THE CONTROL DEVICES WERE INSPECTED AND MAINTAINED AS DESCRIBED BELOW.
   a. EROSION AND SEDIMENT CONTROL PRACTICES WERE CHECKED FOR STABILITY AND OPERATION FOLLOWING EVERY RUNOFF-PRODUCING RAINFALL, AND NO LESS THAN ONCE EVERY WEEK. ANY NECESSARY REPAIRS WERE MADE WITHIN 48 HOURS TO MAINTAIN ALL PRACTICES AS DESIGNED.
   b. SEDIMENT ACCUMULATIONS AT THE SILT FENCE WERE REMOVED WHEN THE DEPTH OF THE SEDIMENT AT THE SILT FENCE REACHED 0.5 FT. REPAIRS WERE MADE WITHIN 48 HOURS TO THE FENCE TO MAINTAIN IT AS A BARRIER.
   c. THE STABILIZED CONSTRUCTION ENTRANCES/DECONTAMINATION ZONES WERE MAINTAINED IN A CONDITION WHICH PREVENTED THE TRACKING OF SEDIMENTS ONTO PUBLIC RIGHT-OF-WAY OR ROADS.
   d. ALL TEMPORARY EROSION AND SEDIMENT CONTROL PRACTICES WERE MAINTAINED AND REPAIRED AS NEEDED TO ASSURE CONTINUED PERFORMANCE OF THEIR INTENDED FUNCTION. ALL MAINTENANCE AND REPAIR WERE CONDUCTED IN ACCORDANCE WITH THE PRACTICE SELECTED.
9. ALL TEMPORARY EROSION AND SEDIMENT CONTROL PRACTICES WERE REMOVED WITHIN 30 DAYS AFTER FINAL SITE STABILIZATION WAS ACHIEVED OR AFTER THE TEMPORARY PRACTICES WERE NO LONGER NEEDED. TRAPPED SEDIMENT WAS REMOVED OR STABILIZED ON SITE.

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DEPARTMENT OF THE NAVY
NAVAL FACILITIES ENGINEERING COMMAND, MID-ATLANTIC
NAVAL WEAPONS INDUSTRIAL RESERVE PLANT
BETHPAGE, NEW YORK

NAVAL FACILITIES ENGINEERING COMMAND, MID-ATLANTIC

SITE 1, FORMER DRUM MARSHALLING AREA
SOIL VAPOR EXTRACTION CONTAINMENT SYSTEM
MISCELLANEOUS SECTIONS AND DETAILS

APPROVED — DATE — EFANE FOR COMMANDER, NAVFAC

SEAL AREA

STATE OF NEW YORK · ABRAHAM VARGHESE · LICENSED PROFESSIONAL ENGINEER · 087171

JEBBY ABRAHAM VARGHESE, P.E.
NYPE NO. 087171
EXPIRATION DATE 6/30/2012

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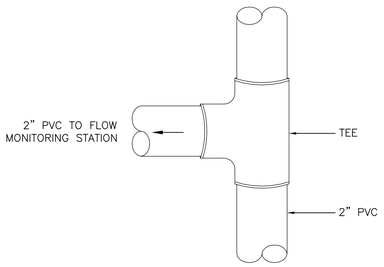
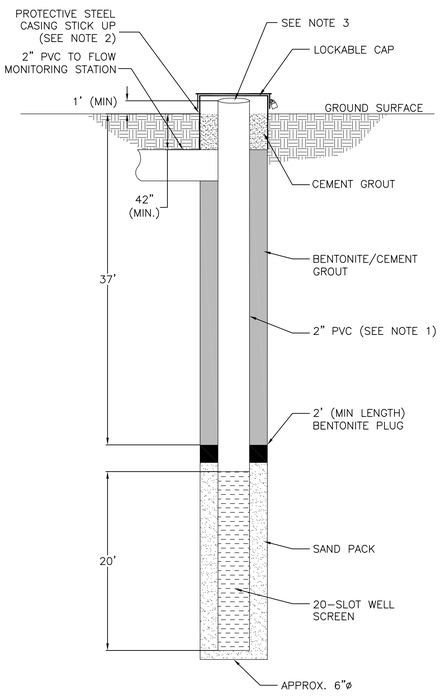
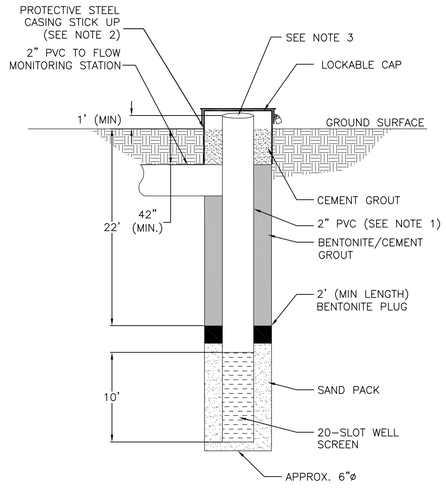


DETAIL 3 (N.T.S.) TEE CONNECTION



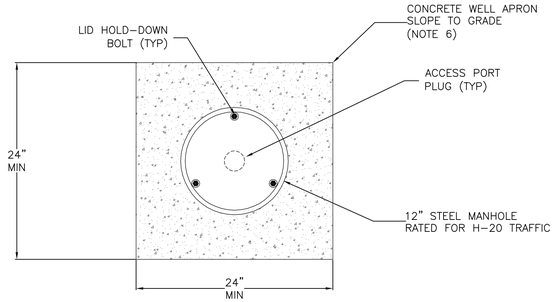
DETAIL 4 (N.T.S.) DEEP SOIL VAPOR EXTRACTION WELL DETAIL



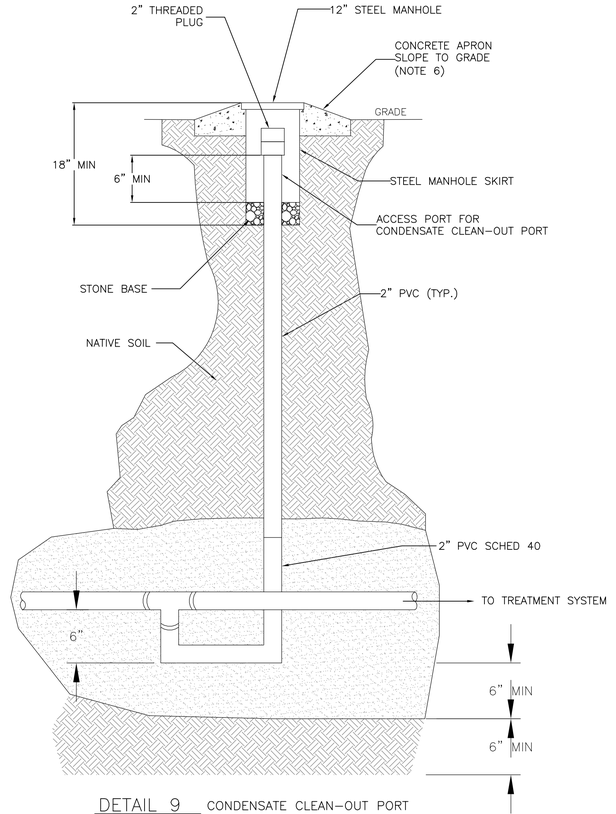
DETAIL 5 (N.T.S.) INTERMEDIATE DEPTH SOIL VAPOR EXTRACTION WELL DETAIL

NOTES:

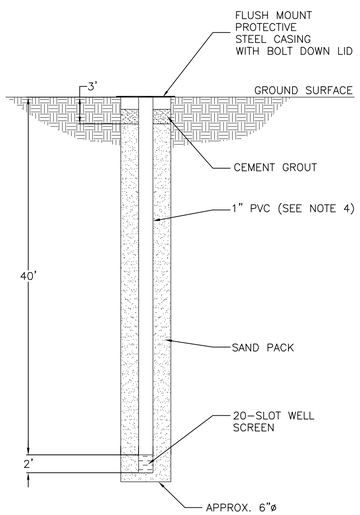
1. RISER PIPE IS 2" SCHED 40 PVC. SEE DETAIL 3 FOR CONNECTION TO TRANSFER LINE.
2. PROTECTIVE STEEL CASING HAS LOCKABLE CAP.
3. WELL RISER CAP IS LOCKING PLUG STYLE.
4. PRESSURE MONITOR RISER IS 1" SCHED 40 PVC.
5. SOIL VAPOR TRANSFER PIPELINE BETWEEN MONITORING STATION AND TREATMENT BUILDING HAS 0.1% SLOPE TOWARDS CONDENSATE CLEAN-OUT PORTS.
6. MINIMUM APRON IS 4" CONCRETE OF 4 KSI WITH 6X6 WWF. APRON PITCHED AWAY FROM MANHOLE AT APPROXIMATLEY 2%.



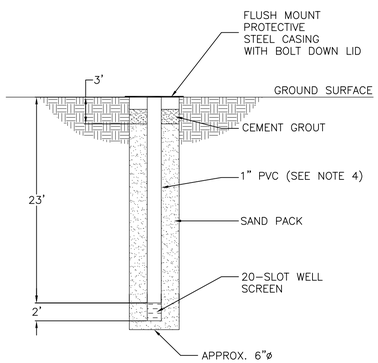
DETAIL 10 (N.T.S.) CONDENSATE CLEAN-OUT PORT PLAN VIEW (TYP.)



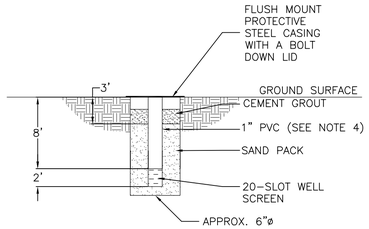
DETAIL 9 (N.T.S.) CONDENSATE CLEAN-OUT PORT SECTION VIEW (TYP.)



DETAIL 6 (N.T.S.) DEEP SOIL VAPOR PRESSURE MONITOR



DETAIL 7 (N.T.S.) INTERMEDIATE DEPTH SOIL VAPOR PRESSURE MONITOR



DETAIL 8 (N.T.S.) SHALLOW SOIL VAPOR PRESSURE MONITOR

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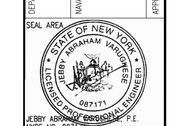
DEPARTMENT OF THE NAVY
NAVAL FACILITIES ENGINEERING COMMAND, MID-ATLANTIC
NAVAL WEAPONS INDUSTRIAL RESERVE PLANT, BETHPAGE, NEW YORK
SITE 1, FORMER DRUM MARSHALLING AREA
SOIL VAPOR EXTRACTION CONTAINMENT SYSTEM
WELL SECTIONS AND DETAILS

NAVAL FACILITIES ENGINEERING COMMAND, MID-ATLANTIC | APPROVED | DATE
FOR COMMANDER, NAVFAC | DATE

SEAL AREA



JEBBY ABRAHAM VARGHESE, P.E.
NYPE NO. 087171
EXPIRATION DATE 6/30/2012

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CODE I.D. NO.
SCALE : AS SHOWN
SPEC. NO.
CONSTRN. CONTR. NO. N62473-10-D-3211
NAVFAC DRAWING NO.
SHEET | OF
SIZE: D | DIS. SH. NO. C-5

LEGEND FOR SINGLE LINE

- GROUND
- MAGNETIC BREAKER
  7A — BREAKER MAX. CONT. AMP
  18–70 — ADJ. INST. TRIP
  M — MAGNETIC TRIP
- 1 — SIZE 1, FULL VOLTAGE NON–REVERSING, COMBINATION MOTOR STARTER WITH MAGNETIC BREAKER
- MEDIUM VOLTAGE FUSED LOAD INTERRUPTER POLE MOUNTED SWITCH MANUALLY OPERATED
- TRANSFORMER OIL FILLED
- TRANSFORMER DRY TYPE
- CONTACT NORMALLY OPEN
- CONTACT NORMALLY CLOSED
- H O A — HAND–OFF–AUTO SELECTOR SWITCH
- S S — START–STOP PUSHBUTTON
- MAGNETIC BREAKER
  7A — BREAKER MAX. CONT. AMP
  18–70 — ADJ. INST. TRIP
  M — MAGNETIC TRIP
- ST — SOLID STATE TRIP, WITH LONG TIME INSTANTANEOUS, SHORT TIME AND GROUND FAULT TRIP
- THERMAL MAGNETIC BREAKER
  100 AF — BREAKER FRAME SIZE
  20 AT — BREAKER TRIP
  TM — THERMAL MAGNETIC
- POTENTIAL TRANSFORMER
- CURRENT TRANSFORMER
- AS — AMMETER SWITCH
- VS — VOLTMETER SWITCH
- LCP — LOCAL CONTROL PANEL
- FVNR STARTER
- FUSE
- 2 HP — MOTOR
- A — AMMETER
- V — VOLTMETER
- LA — LIGHTNING ARRESTOR AND SURGE CAPACITOR
- 480V, 3ø, ELECTRICAL HEATER
- M — UTILITY METER
- DISCONNECT SWITCH

LEGEND FOR FIRE ALARM AND SECURITY

- FA — MANUAL FIRE ALARM PULL STATION
- FCP — FIRE ALARM CONTROL PANEL
- HD — HEAT DETECTOR
- SD — SMOKE DETECTOR
- H — FIRE ALARM HORN WITH FLASHER
- DS — DOOR SWITCH
- SCP — SECURITY CONTROL PANEL
- PFE — PORTABLE FIRE EXTINGUISHER

LEGEND FOR INSTRUMENTS

- 110V. AC INSTRUMENT (DIGITAL SW)
- 4–20 mA SIGNAL INSTRUMENT
- 4–20 mA SENSOR
- 4–20 mA SIGNAL INSTRUMENT REQUIRES 110V AC POWER
- M — MOTOR OPERATED VALVE (MOV)
- S — SOLENOID OPERATED VALVE (SOV)
- PLC — PROGRAMABLE LOGIC CONTROLLER CABINET
- PHONE JACK

LEGEND FOR POWER

- CABLE TRAY
- ABOVE GROUND CONDUIT
- UNDERGROUND CONDUIT
- J — JUNCTION BOX
- P — PULL BOX
- UH — UNIT HEATER
- M — MOTOR
- CP — CONTROL PANEL
- POWER OUTLET
- 30A — DISCONNECT SWITCH
- T — TRANSFORMER
- PP — POWER PANEL BOARD 277/480V, 3ø, 4W

LEGEND FOR LIGHTING

- HIGH PRESSURE SODIUM LIGHTING (HPS) LIGHTING FIXTURE (M.H. 20'–0" AFF)
  PNL NO. 1–2 CKT NO.
- OUTDOOR WALL PACK FIXTURE (HPS) WITH PHOTOELECTRIC CELL (M.H. 10'–0" AFF)
- MS — OUTDOOR WALL PACK FIXTURE WITH PHOTOELECTRIC CELL AND MOTION SENSOR (M.H. 10'–0" AFF)
- X — EXIT LIGHT
- F — CEILING MOUNTED SINGLE TUBE FLUROSENT LIGHT
- F — CEILING MOUNTED DOUBLE TUBE FLUROSCENT LIGHT
- WALL MOUNTED EMERGENCY BATTERY PACK (M.H. 10'–0" AFF)
- RECEPTACLE 480V, 20A, 3 POLE
- DUPLEX RECEPTACLE (M.H. 1'–6" AFF)
  WP – WEATHER PROOF
  GFCI – GROUND FAULT CIRCUIT INTERRUPTER
  XP – EXPLOSION PROOF
  PNL NO. 1–2 CKT NO.
- LP — LIGHTING PANEL BOARD
- J — JUNCTION BOX
- HOME RUN TO 120V PANEL BOARD 3/4"C–2#12&1#12G
- $ — SINGLE POLE SWITCH (M.H. 4'–0" AFF)
- $3 — THREE WAY SWITCH (M.H. 4'–0" AFF)
- CORD WITH PLUG
- TS — THERMOSTAT
- AIR TERMINAL WITH ADHESIVE BASE
- AIR TERMINAL WITH BOLTED BASE

ELECTRICAL–POWER ABOVE GROUND POWER CABLE AND WIRE NOTES

1. THE SMALLEST WIRE SIZE FOR POWER CIRCUITS 600 VOLTS & BELOW IS #12 AWG, EXCEPT THAT #14 AWG IS USED FOR CONTROL.
2. WHERE WIRES IN CONDUIT ARE USED, WIRES FOR POWER & CONTROL LEADS TO MOTORS 600 VOLTS & BELOW WERE INSTALLED IN THE SAME CONDUIT WHEN THE POWER WIRE IS #2 AWG. OR SMALLER. FOR POWER WIRES LARGER THAN #2 AWG POWER & CONTROL WIRES WERE INSTALLED IN SEPARATE CONDUITS.
3. POWER & CONTROL WIRES ARE LABELED WITH A WIRE NUMBER AS SHOWN IN ELEMENTARY & INTERCONNECTION WIRING DIAGRAMS.
4. THE COLOR CODING FOR SINGLE CONDUCTOR WIRES IS AS FOLLOWS:
   A) POWER PHASE LEADS – 480V SYSTEM IS IDENTIFIED WITH BROWN/ORANGE/YELLOW MARKING TAPE
   B) ALL CONTROL LEADS INCLUDING THOSE FOR CONTROL STATIONS, INTERLOCKING CIRCUITS, CURRENT TRANSFORMERS ETC., IS RED.
   C) ALL GROUNDING IS EITHER BARE OR HAS A GREEN COVERING.
   D) TWO WIRE 120VAC BRANCH CIRCUITS IS AS FOLLOWS
      THE GROUNDED CONDUCTOR IS WHITE
      THE UNGROUNDED CONDUCTOR IS BLACK
      ALL BRANCH CIRCUIT WIRES IS IDENTIFIED & LABELED TO MATCH PANEL CIRCUIT DIRECTORIES.
5. WIRES INSTALLED IN CONDUIT:
   A) FOR SERVICES 600 VOLT & BELOW WIRE #14 AWG & LARGER IS 600 VOLT SINGLE CONDUCTOR, STRANDED COPPER HEAT & MOISTURE RESISTANT THERMOPLASTIC INSULATION 75°C TYPE THHN/THWN.
   B) FOR 15KV SERVICE, CABLE IS AS SPECIFIED BY UTILITY COMPANY (LONG ISLAND POWER AUTHORITY).
   C) INSTRUMENT SIGNAL CABLE:
      INSTRUMENT SIGNAL CABLE IS SINGLE TWISTED PAIR #16, STRANDED COPPER, 300V, PVC INSULATION WITH OVERALL ALUMINUM MYLAR SHIELD, UL LISTED AS PLTC AND OVERALL PVC JACKET.

ELECTRICAL–POWER ABOVE GROUND POWER GENERAL NOTES

1. ALL ELECTRICAL INSTALLATIONS WERE COMPLETED IN A WORKMANLIKE MANNER IN CONFORMANCE WITH TTEC ELECTRICAL SPECIFICATIONS FOR THIS CONTRACT, THE NATIONAL ELECTRICAL CODE, ALL LOCAL CODES AND REGULATION. (AND ALL APPLICABLE DRAWINGS AND DETAILS).
2. ALL EQUIPMENT AND MATERIALS FURNISHED TO COMPLETE INSTALLATIONS WAS TESTED, LABELED OR OTHERWISE DETERMINED TO BE SUITABLE FOR THEIR INTENDED USE BY A RECOGNIZED INDEPENDENT TESTING LABORATORY SUCH AS UNDERWRITERS LABORATORIES INC., OR FACTORY MUTUAL ENGINEERING CORP. (U.L. OR F.M.).
3. BEFORE INSTALLING ELECTRICAL RACEWAY SYSTEM, A CAREFUL CHECK WAS COMPLETED TO AVOID INTERFERENCES WITH EQUIPMENT, PIPING & STRUCTURES. THE RACEWAY SYSTEM IS SHOWN DIAGRAMMATICALLY AND EXACT ROUTING WAS DETERMINED IN FIELD.
4. RACEWAY SYSTEM IS PROPERLY SUPPORTED. SUPPORTS ARE NOT MORE THAN 10'–0" APART AND WITHIN 3'–0" OF A BOX, FITTINGS OR CABINET.
5. ALL CONDUITS, COUPLINGS & ELBOWS ARE RIGID STEEL OR INTERMEDIATE METAL CONDUIT WITH A HOT DIPPED GALVANIZED COATING INSIDE & OUTSIDE. THREADS HAVE A PROTECTIVE ZINC COATING, UNLESS OTHERWISE NOTED.
6. MINIMUM CONDUIT SIZE FOR ABOVE GROUND INSTALLATION IS 3/4".
7. ALL UNUSED OPENINGS IN FITTINGS, BOXES, ETC., ARE PLUGGED WITH A CONDUIT PLUG. DURING CONSTRUCTION, ALL OPENINGS WERE KEPT CLOSED TO PREVENT MOISTURE & FOREIGN MATERIAL, SUCH AS DIRT & DEBRIS, FROM ENTERING THE CONDUIT SYSTEM.
8. CONNECTIONS IN MOTOR TERMINAL BOXES AND ALL OTHER SPLICES, WHERE NECESSARY, WERE MADE WITH SOLDERLESS CONNECTORS PER MANUFACTURER'S INSTRUCTIONS.
9. CONDUIT FITTINGS ARE STANDARD THREADED WITH COVERS & GASKETS, TYPE FORM 8 FERALOY OR APPROVED EQUAL, FOR UNCLASSIFIED & CLASS 1, DIV. 2 AREAS.
10. ALL WIRE & CABLES WERE PULLED INTO THEIR CONDUITS BY APPLICATION OF A SUITABLE COMMERCIAL PULLING COMPOUND, "PLOY–EAS" FOR POLYETHYLENE INSTALLATION.
11. ALL CABLES FURNISHED WITH SHIELDING WERE TERMINATED WITH STRESS CONES & GROUNDED IN ACCORDANCE WITH THE MANUFACTURER'S RECOMMENDATION.
12. CONTROL WIRING WAS IDENTIFIED USING SLEEVE TYPE WIRE MARKERS WITH IDENTIFICATION CORRESPONDING TO THAT ON WIRING DIAGRAMS. WIRE MARKERS WERE INSTALLED AT ALL TERMINAL & JUNCTION POINTS. WIRE MARKER IS RAYCHEM "TMS" HEAT SHRINKABLE SLEEVES.

ELECTRICAL–LIGHTING GENERAL NOTES

1. LIGHTING PANELS, LIGHTING FIXTURES, RECEPTACLES AND OTHER ITEMS WERE LOCATED AS SHOWN ON THE DRAWINGS. LOCATION OF LIGHTING FIXTURES SHOWN ON THE DRAWINGS ARE IN GENERAL, APPROXIMATE. EXACT LOCATIONS TO AVOID INTERFACE WITH PIPING AND STRUCTURES, ETC., WERE DETERMINED IN THE FIELD.
3. CONDUIT SUPPORTS ARE PROVIDED WHERE REQUIRED SUCH AS AT FIXTURE LOCATIONS, RECEPTACLES, ELEVATION CHANGES, FITTING AND BOXES. ALL CONDUIT SUPPORT HARDWARES SHOWN AS GALV. CLAMPS, STRAPS, CLIPS. CHANNEL IS HOT–DIPPED GALVANIZED STEEL FINISH.
3. CONTRACTOR INSTALLED UNIONS, BUSHINGS, COUPLINGS AND NIPPLES AS REQUIRED FOR PROPER CONDUIT MAKE UP. CONDUIT FITTINGS WERE INSTALLED WITH COVER OPENING IN THE VERTICAL PLANE OR DOWNWARD IN THE HORIZONTAL PLANE.
4. ALL UNUSED OPENINGS IN FIXTURES, BOXES AND FITTINGS WERE PLUGGED & SEALED BY APPROVED METHODS.
5. BEFORE INSTALLING LIGHTING CONDUITS, FIXTURES, ETC., A CAREFUL CHECK WAS MADE TO AVOID INTERFERENCES WITH PIPING, EQUIPMENT, ETC., IF NOT OTHERWISE SPECIFIED. CONDUIT RUNS WERE KEPT AT LEAST 12" AWAY FROM HOT SURFACES.
6. CONDUIT AND WIRING NOT IDENTIFIED ON DRAWINGS WAS DETERMINED IN FIELD AS FOLLOWS:
   A) MAXIMUM CONDUIT SIZE IS 1" EXCEPT DROPS TO PANELBOARDS WERE 1 1/2".
   B) MINIMUM WIRE SIZE IS #12 AWG EXCEPT THAT #14 AWG, STRANDED, 600 VOLT TYPE SF–2 FIXTURE WIRE WAS INSTALLED BETWEEN EACH LIGHTING FIXTURE AND THE NEAREST CONDUIT FITTING IN THE RUN.
7. ALL ABOVE GROUND CONDUIT IS RIGID STEEL UNLESS OTHERWISE NOTED, ALL ABOVE GROUND LIGHTING CONDUIT IS 3/4" INCH MINIMUM OR 1" INCH MAXIMUM, WHERE PRACTICAL.
8. ALL LIGHTING FIXTURE ELEVATIONS ARE SHOWN FROM FINISHED GRADE, FINISHED FLOOR OR PLATFORM ELEVATION TO THE BOTTOM OF FIXTURE GLOBE. MINOR VARIATIONS TO SUIT FIELD CONDITIONS WERE ALLOWED.

TETRA TECH ENGINEERING CORPORATION PC

REV	DESCRIPTION	PREP BY	DATE	APPRVD
0	ISSUED FOR CONSTRUCTION	DLB	10–14–09	SCP
1	RECORD DRAWING (NO CHANGES)	DB	5–27–10	HCR

DSGN. HB DR. BMV CH. PMC CHK. HR
SUBMITTED BY: (TRIM MEMBER) (TITLE) (DATE)
SOUTHWESTERN DIV. NAVFAC HQ: FEC: DPRL:
OFFICER IN CHARGE APPROVED DATE

DEPARTMENT OF THE NAVY
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NAVAL WEAPONS INDUSTRIAL RESERVE PLANT BETHPAGE, NEW YORK
SITE 1, FORMER DRUM MARSHALLING AREA
SOIL VAPOR EXTRACTION CONTAINMENT SYSTEM
ELECTRICAL LEGEND AND GENERAL NOTES
NAVAL FACILITIES ENGINEERING COMMAND EFANE FOR COMMANDER, NAVFAC
APPROVED DATE

SEAL AREA
STATE OF NEW YORK HARISH C. RAMA 071378 REGISTERED PROFESSIONAL ENGINEER
HARISH C. RAMA, P.E.
NYPE NO. 071378

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SHEET OF
SIZE: D DIS. SH. NO. E–1

BETHPAGE SITE 1 EXISTING PANEL 120/208V

REV.	SERVICE	CABLE SIZE (AWG)	CKT NO.	BREAKER TRIP AMPS	BREAKER TRIP TYPE	POL.	LOAD VA	MAIN BUS	LOAD VA	POL.	BREAKER TRIP TYPE	BREAKER TRIP AMPS	CKT NO.	CABLE SIZE (AWG)	SERVICE	REV.
	BLDG LTG FIXTURES (5)	12	1	20	TM	1	1200						2		EXISTING USE	
	BLDG LTG FIXTURES (4)	12	3	20	TM	1	1200			3	TM	20	4			
	EXISTING USE		5	20	TM	1							6			
	EXISTING USE		7	20	TM	1				1	TM	20	8		EXISTING USE	
	EXISTING USE		9	20	TM	1				2	TM		10		EXISTING USE	
	EXISTING USE		11	20	TM	1					TM		12			
	EXISTING USE		13	20	TM	1			800	1	TM	20	14	12	**BLDG RECEPTACLES (3)	
	EXISTING USE		15	20	TM	1			800	1	TM	20	16	12	**BLDG RECEPTACLES (3)	
	EXISTING USE		17	20	TM	1			400	1	TM	20	18	12	*EXIT LTG & EMERGENCY BATTERY PACK	
	CONTROL PANEL/AUTODIALER	12	19	20	TM	1	400		500	2	TM TM	30	20 22	12	BUILDING EXHAUST FAN V-1	
	FLOW INDICATOR FQI-101	12	21	20	TM	1	50		500	2	TM TM	30	24 26	12	BUILDING EXHAUST FAN V-2	
	SPARE	12	23	20	TM	1	400									

150A

BUS NAMPEPLATE: EXISTING PANEL LP

CABINET TYPE: NEMA-1
MIN. REQ'D IC: 10,000 A RMS SYM, MIN (FOR PANEL AND BREAKERS)

NORMAL SERVICE: 208/120v, 3φ,4WIRE

MAIN BUS: 200A

MAIN: 150A, BREAKER
MOUNTING: WALL

LOCATION: Existing warehouse
DWG: E-3

* LOCK BREAKER IN "ON" POSITION
** PROVIDES GFCI PROTECTION

BETHPAGE SITE 1 NEW 480V PANEL

REV.	SERVICE	CABLE SIZE (AWG)	CKT NO.	BREAKER TRIP AMPS	BREAKER TRIP TYPE	POL.	LOAD VA	MAIN BUS	LOAD VA	POL.	BREAKER TRIP TYPE	BREAKER TRIP AMPS	CKT NO.	CABLE SIZE (AWG)	SERVICE	REV.
	EXISTING BLDG SUPPLY	3#2/0	1	200	TM	3	–			3	TM	30	2	12	SPARE	
	7 1/2 HP BLOWER B-1A	10	3	30	TM	3	5600			3	TM	30	4		SPARE	
	7 1/2 HP BLOWER B-1B	10	5	30	TM	3	5600		5000	3	TM	30	6	10	5 KW HEATER H-1A	
	CONVENIENCE RECEPTACLE	10	7	20	TM	3	1000		5000	3	TM	30	8	10	5 KW HEATER H-1B	
			9		TM						TM		10			
			11		TM						TM		12			

400A

BUS NAMPEPLATE: PP-1

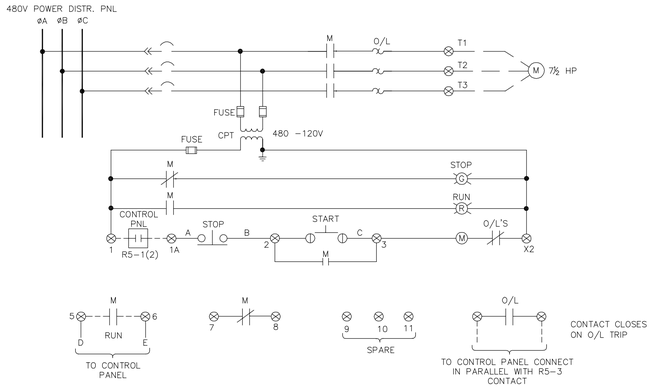
CABINET TYPE: NEMA-12
MIN. REQ'D IC: 22,000 A RMS SYM, MIN (FOR PANEL AND BREAKERS)

NORMAL SERVICE: 277/480V, 3φ, 4 WIRE, 22 KAIC

MAIN BUS: 400A

MAIN: 400A, BREAKER
MOUNTING: WALL

LOCATION: Existing warehouse
DWG: E-3



MOTOR CONTROL DIAGRAM

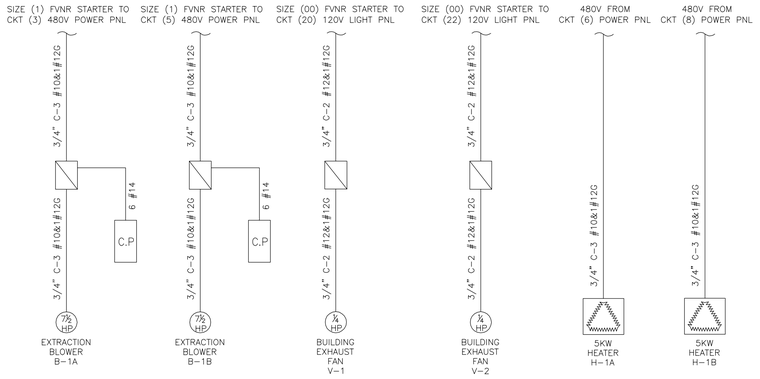
B–1A & B–1B

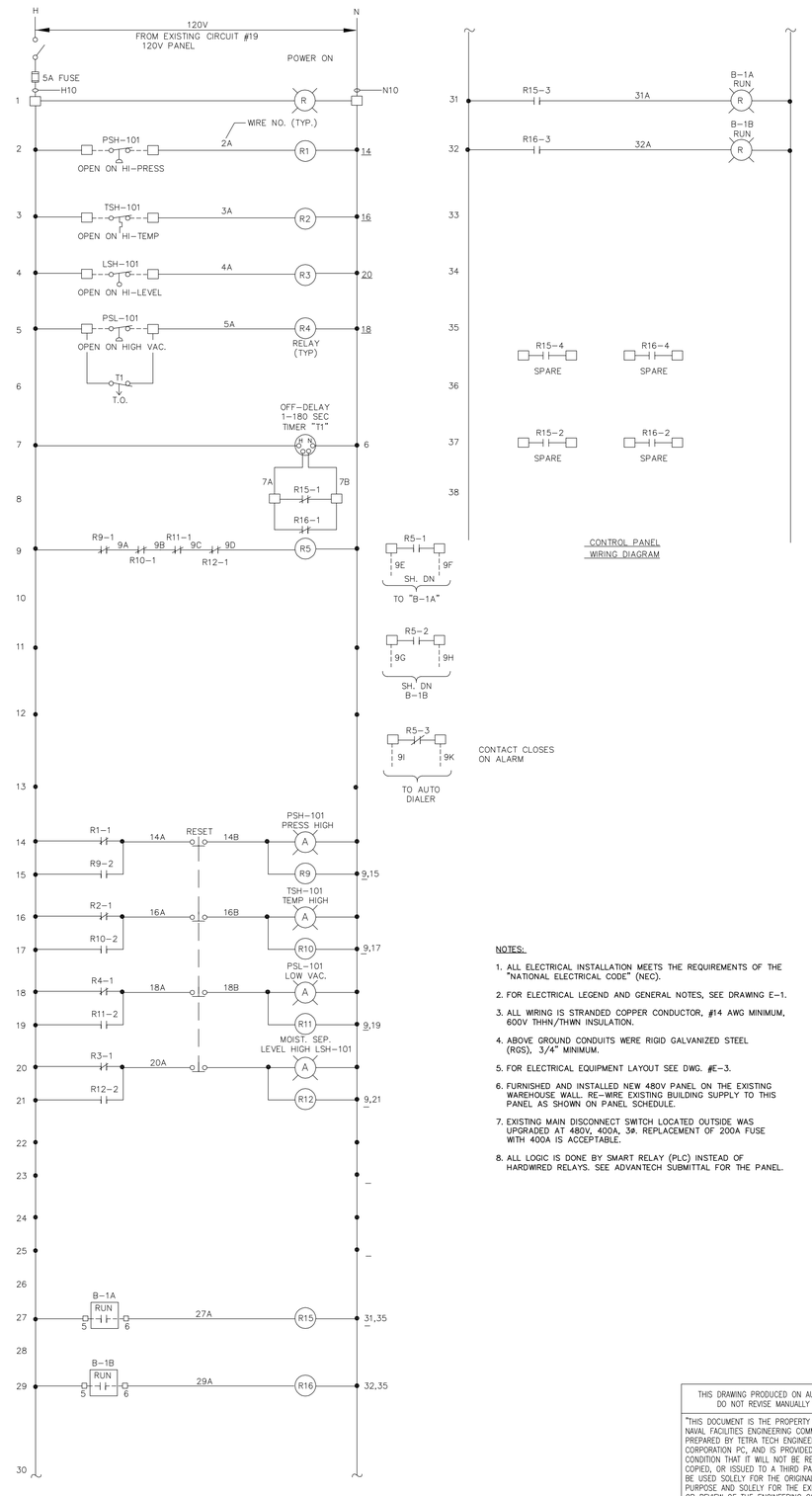
⊗ – TERMINAL LOCATED IN STARTER

□ – TERMINAL LOCATED IN CONTROL PANEL

——— – WIRING BY VENDOR

– – – – – – WIRING IN FIELD





NOTES:

1. ALL ELECTRICAL INSTALLATION MEETS THE REQUIREMENTS OF THE "NATIONAL ELECTRICAL CODE" (NEC).
2. FOR ELECTRICAL LEGEND AND GENERAL NOTES, SEE DRAWING E–1.
3. ALL WIRING IS STRANDED COPPER CONDUCTOR, #14 AWG MINIMUM, 600V THHN/THWN INSULATION.
4. ABOVE GROUND CONDUITS WERE RIGID GALVANIZED STEEL (RGS), 3/4" MINIMUM.
5. FOR ELECTRICAL EQUIPMENT LAYOUT SEE DWG. #E–3.
6. FURNISHED AND INSTALLED NEW 480V PANEL ON THE EXISTING WAREHOUSE WALL. RE–WIRE EXISTING BUILDING SUPPLY TO THIS PANEL AS SHOWN ON PANEL SCHEDULE.
7. EXISTING MAIN DISCONNECT SWITCH LOCATED OUTSIDE WAS UPGRADED AT 480V, 400A, 3ø. REPLACEMENT OF 200A FUSE WITH 400A IS ACCEPTABLE.
8. ALL LOGIC IS DONE BY SMART RELAY (PLC) INSTEAD OF HARDWIRED RELAYS. SEE ADVANTECH SUBMITTAL FOR THE PANEL.

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TETRA TECH ENGINEERING CORPORATION PC

DESIGN: JB DR: SMW CH: HR DY ENG: (TITLE) (DATE)
SUBMITTED BY: (FIRM MEMBER) SOUTHWESTERN DIV. NAVFAC HQ: HQ FFE: DIR:
OFFICER IN CHARGE

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NAVAL WEAPONS INDUSTRIAL RESERVE PLANT BETHPAGE, NEW YORK

NAVAL FACILITIES ENGINEERING COMMAND, MID–ATLANTIC

SOIL VAPOR EXTRACTION CONTAINMENT SYSTEM
SITE 1, FORMER DRUM MARSHALLING AREA
ELECTRICAL SINGLE LINE AND PANEL DIAGRAMS

EFANE FOR COMMANDER, NAVFAC

DATE

APPROVED

SEAL AREA

HARISH C. OAK, P.E.
NYPE NO. 071378

SAT TO DATE

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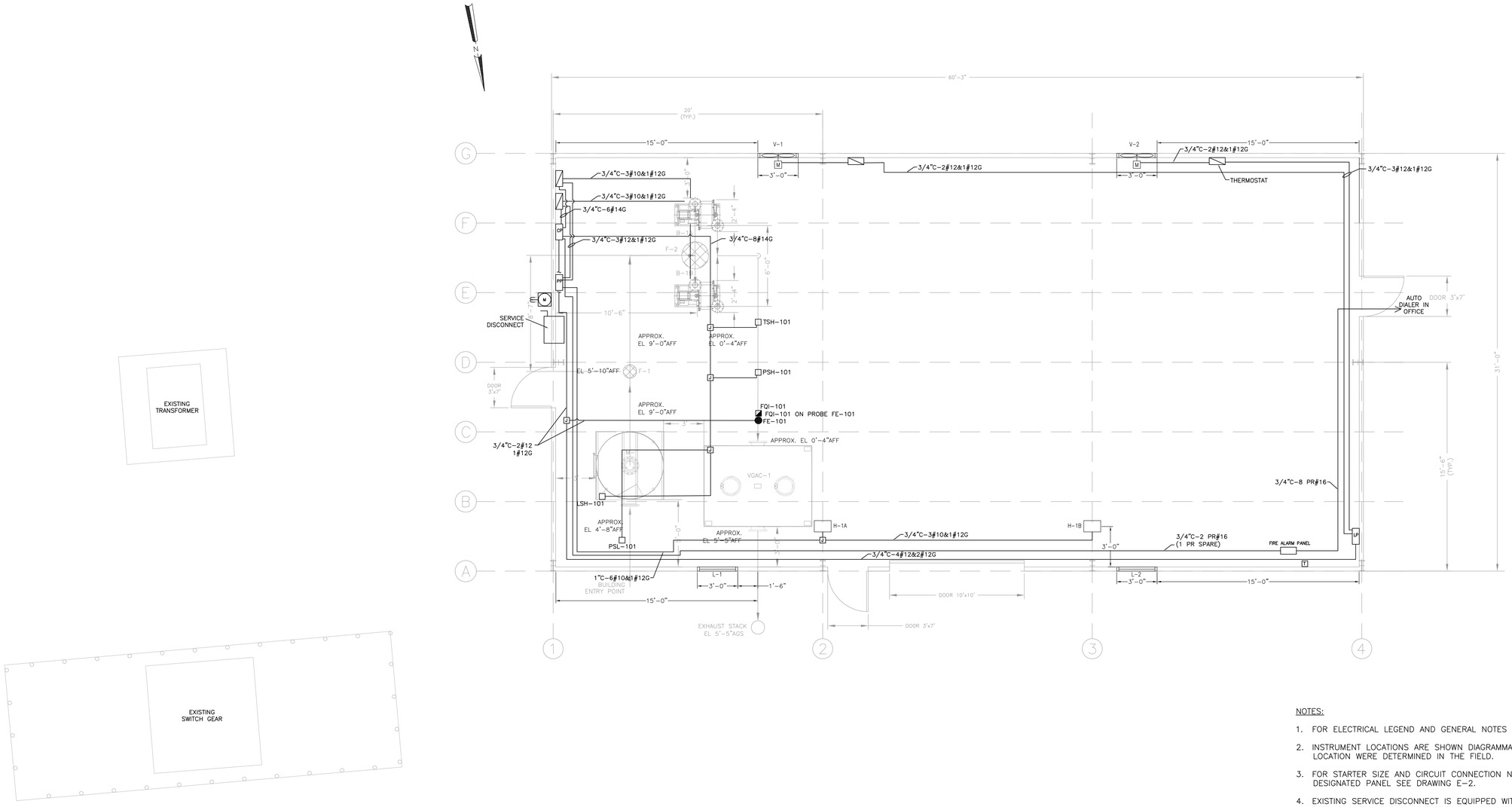

NOTES:

1. FOR ELECTRICAL LEGEND AND GENERAL NOTES SEE DRAWING E-1.
2. INSTRUMENT LOCATIONS ARE SHOWN DIAGRAMMATICALLY ONLY. EXACT LOCATION WERE DETERMINED IN THE FIELD.
3. FOR STARTER SIZE AND CIRCUIT CONNECTION NUMBER IN DESIGNATED PANEL SEE DRAWING E-2.
4. EXISTING SERVICE DISCONNECT IS EQUIPPED WITH 200A FUSE. REPLACE SERVICE DISCONNECT SWITCH 200A FUSE WITH 400A FUSE. VERIFY THAT SERVICE DISCONNECT IS RATED 480V, 400A, THREE PHASE, 60HZ.

4 0 4 8

1" = 4'

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SUBMITTED BY: (FIRM MEMBER) (TITLE) (DATE)
SOUTHWESTDIV DM: HD:
PPE: HD:
OFFICER IN CHARGE DR:
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071378
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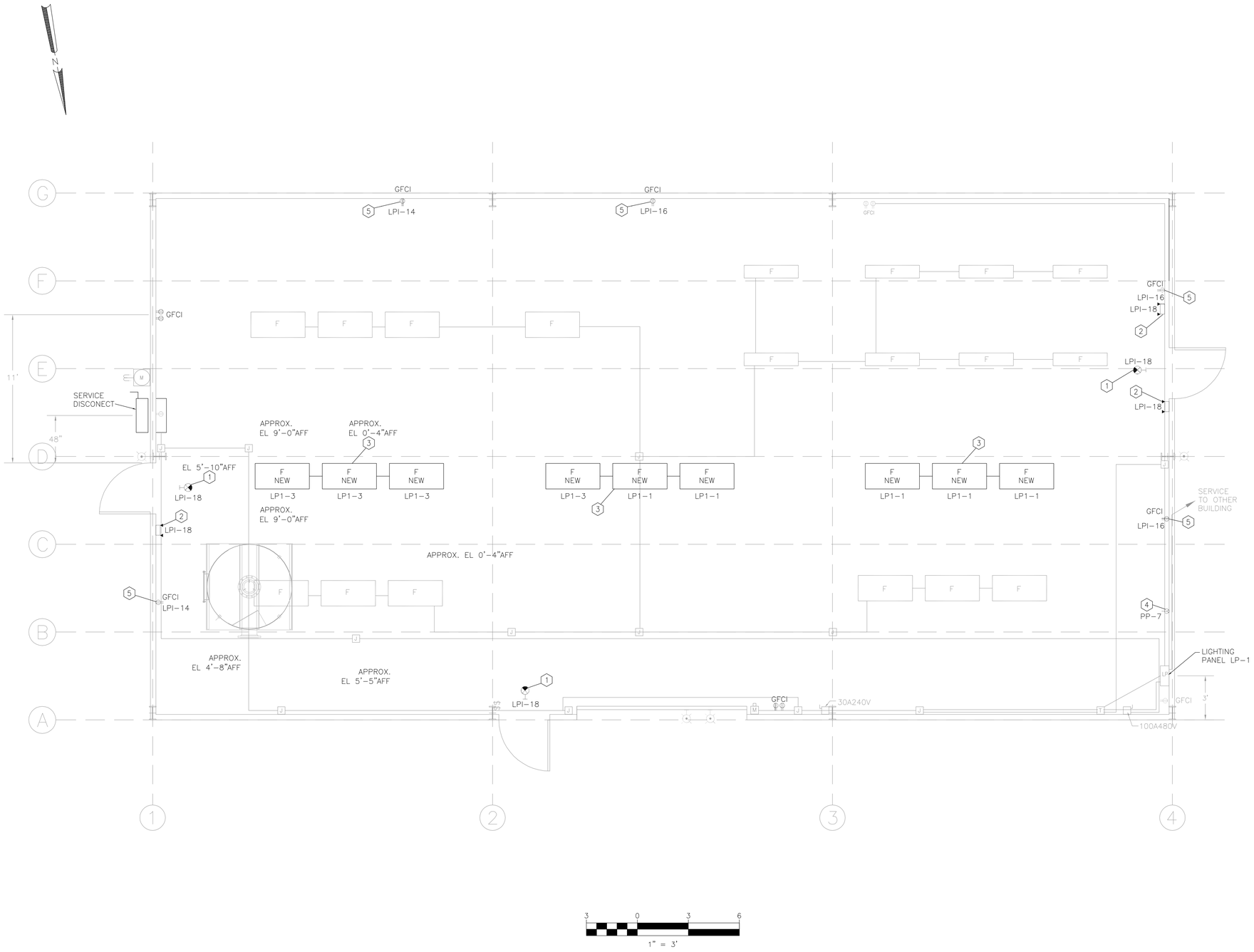
DIS. SH. NO. E-3



NOTES:

1. FOR ELECTRICAL LEGEND AND GENERAL NOTES SEE DRAWING E-1.
2. PRESENT LAMPS WERE CONNECTED TO EXISTING LIGHT PANEL CIRCUIT.
3. DUPLEX RECEPTACLES WERE CONNECTED TO EXISTING 120/280V PANEL.
4. 3 POLE, 480V RECEPTACLE CONNECT TO NEW POWER DISTRIBUTION PANEL.

BILL OF MATERIALS

1. WALL MOUNTED 120 VAC WITH BATTERY BACKUP EXIT LIGHTING FIXTURE. UNIVERSAL FACE WITH RED LETTER
2. EMERGENCY BATTERY PACK WITH SEALED MAINTENANCE FREE LEAD CALCIUM BATTERIES FOR 90 MIN. OPERATION AND TWO 9W, 12V TUNGSTEN LAMPS
3. 4' CEILING MOUNTED, T8 WITH 2-32W FLUORESCENT LAMP WITH ELECTRIC BALLAST
4. 20A, 480V 3 POLE RECEPTACLE
5. 120/125V GFCI DUPLEX RECEPTACLE

TETRA TECH ENGINEERING CORPORATION PC

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APPROVED DATE

NAVAL FACILITIES ENGINEERING COMMAND
DEPARTMENT OF THE NAVY
NAVAL FACILITIES ENGINEERING COMMAND, MID-ATLANTIC
NAVAL WEAPONS INDUSTRIAL RESERVE PLANT BETHPAGE, NEW YORK
SITE 1, FORMER DRUM MARSHALLING AREA
SOIL VAPOR EXTRACTION CONTAINMENT SYSTEM
LIGHTING LAYOUT
APPROVED DATE EFANE FOR COMMANDER, NAVFAC

SEAL AREA
STATE OF NEW YORK HARISH C. RANA 071378 LICENSED PROFESSIONAL ENGINEER
HARISH C. RANA, P.E.
NYPE NO. 071378
SAT TO DATE

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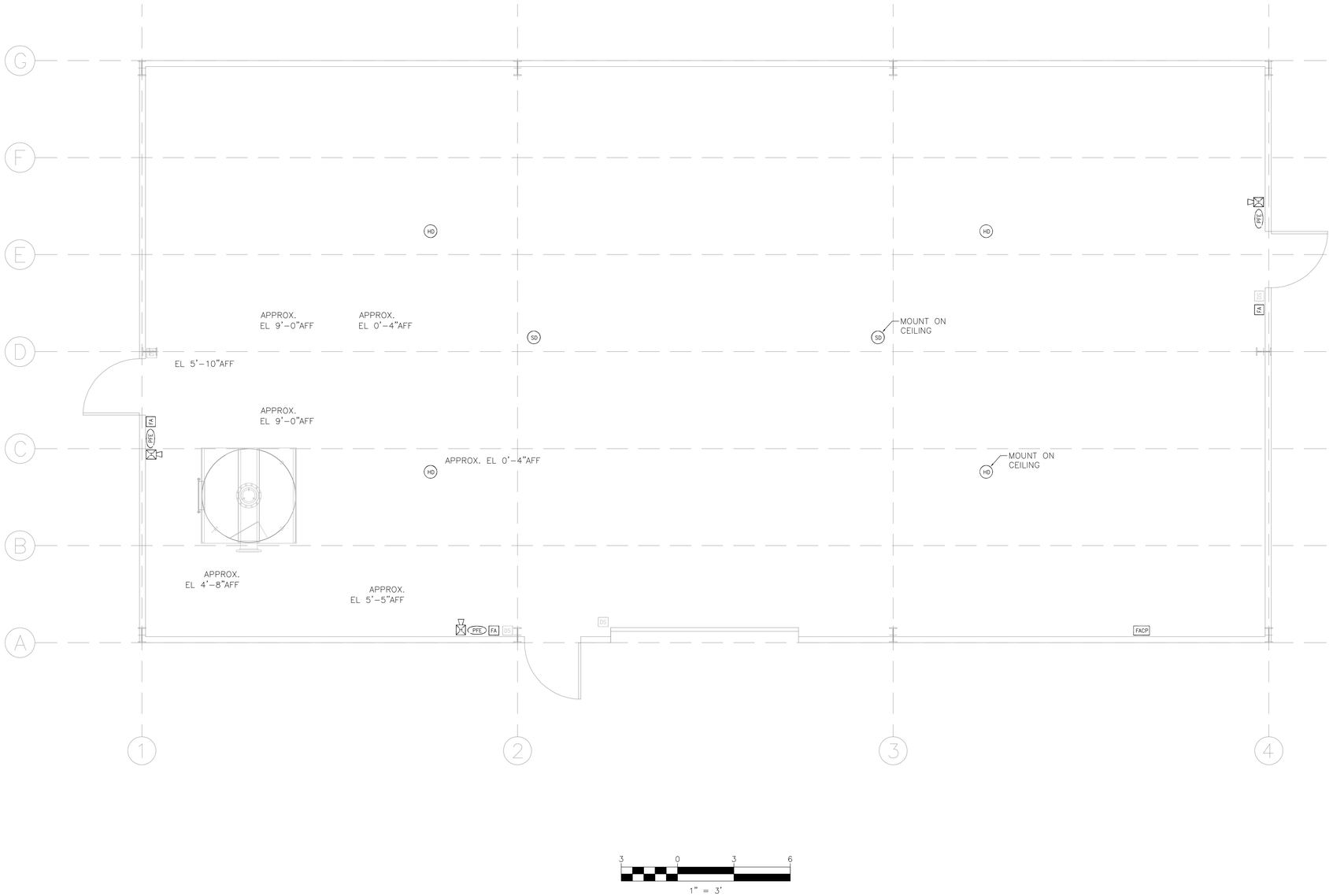

NOTES:

1. FOR ELECTRICAL LEGEND AND GENERAL NOTES SEE DRAWING E-1.
2. FIRE DETECTION/ALARM DEVICES ARE SHOWN AS REFERENCE ONLY.
3. FIRE DETECTION/ALARM DEVICES WERE CONNECTED TO EXISTING FIRE ALARM PANEL.
4. FIRE EXTINGUISHER HAS 10LB, 4A:40B:C (MINIMUM) RATING AND CONSPICUOUSLY LOCATED, SECURED TO WALL USING HANGER OR BRACKET.

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NAVAL FACILITIES ENGINEERING COMMAND, MID-ATLANTIC
NAVAL WEAPONS INDUSTRIAL RESERVE PLANT BETHPAGE, NEW YORK

SITE 1, FORMER DRUM MARSHALLING AREA
SOIL VAPOR EXTRACTION CONTAINMENT SYSTEM
FIRE ALARM PLAN

APPROVED DATE EFANE FOR COMMANDER, NAVFAC

SEAL AREA

STATE OF NEW YORK
HARISH C. RANA
071378
LICENSED PROFESSIONAL ENGINEER

HARISH C. RANA, P.E.
NYPE NO. 071378

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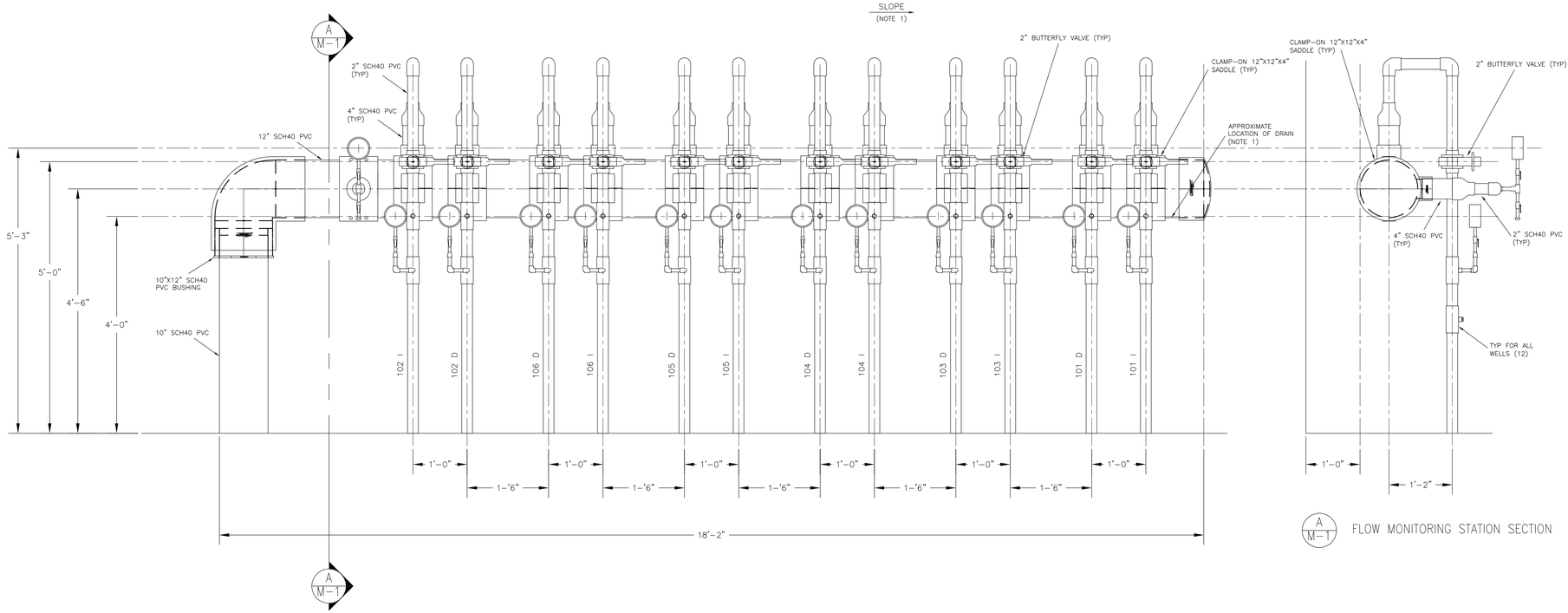
NOTES:

1. 12" PVC HEADER PIPE IS SLOPED 1" FOR EVERY 10' OF PIPE LENGTH AWAY FROM TURNDOWN. A THREADED 1/2" NPT PLUG IS INSTALLED ON THE LOW SIDE OF THE HEADER PIPE FOR DRAINING.
2. SAMPLE PORT AND AIR BLEED PORTS ARE 1" NPT AND CONNECTED TO THE MAIN PROCESS PIPING BY USE OF 1" NPT GALVANIZED PIPE NIPPLE, 1" NPT BRASS BALL VALVE, 1" NPT GALVANIZED PIPE NIPPLE, 1"X2" REDUCER BUSHING AND T-CONNECTION. SAMPLE PORTS AND AIR BLEED PORTS HAVE AN AIR TIGHT NPT CAP.
3. PRESSURE INDICATORS ARE 1/2" NPT AND CONNECTED TO THE MAIN PROCESS PIPING BY USE OF 1/2" NPT GALVANIZED PIPE NIPPLE, 1/2" NPT BRASS BALL VALVE, 1/2" NPT GALVANIZED PIPE NIPPLE, 1"X2" REDUCER BUSHING AND T-CONNECTION.
4. FOR ADDITIONAL PIPING DETAILS INCLUDING SIZES AND MATERIALS, SEE DRAWING P-2.
5. CLAMP-ON 12"X12"X4" SADDLE IS MADE BY SPEARS MANUFACTURING CO.



A M-1 FLOW MONITORING STATION SECTION

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DEPARTMENT OF THE NAVY
NAVAL FACILITIES ENGINEERING COMMAND, MID-ATLANTIC
NAVAL WEAPONS INDUSTRIAL RESERVE PLANT BETHPAGE, NEW YORK
SITE 1, FORMER DRUM MARSHALLING AREA
SOIL VAPOR EXTRACTION CONTAINMENT SYSTEM
FLOW MONITORING STATION PIPING ARRANGEMENT
APPROVED DATE EFANE FOR COMMANDER, NAVFAC

SEAL AREA

STATE OF NEW YORK
GEOFFREY P. KING
No. 080339
LICENSED PROFESSIONAL ENGINEER

GEOFFREY P. KING, P.E.
NYPE NO. 080339-1
EXPIRATION DATE 6/30/2011

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NOTES:

1. BUILDING WALL PENETRATIONS PER DETAIL ON DRAWING C-4.
3. EXHAUST STACK CONSTRUCTED OF 12" SCHEDULE 80 PVC AND EXTEND ABOVE ROOFLINE.

LEGEND:

———	VAPOR PROCESS PIPING AND DUCTWORK
○	PIPING TURNS UPWARD IN THE DIRECTION OF FLOW
◡	PIPING TURNS DOWNWARD IN THE DIRECTION OF FLOW

ABBREVIATIONS:

AFF	ABOVE FINISHED FLOOR
AGS	ABOVE GROUND SURFACE

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NAVAL FACILITIES ENGINEERING COMMAND
NAVAL FACILITIES ENGINEERING COMMAND, MID-ATLANTIC
NAVAL WEAPONS INDUSTRIAL RESERVE PLANT BETHPAGE, NEW YORK

SITE 1, FORMER DRUM MARSHALLING AREA
SOIL VAPOR EXTRACTION CONTAINMENT SYSTEM
TREATMENT BUILDING GENERAL PIPING LAYOUT

APPROVED DATE EFANE FOR COMMANDER, NAVFAC

SEAL AREA

STATE OF NEW YORK · GEOFFREY P. KING · No. 080339 · LICENSED PROFESSIONAL ENGINEER

GEOFFREY P. KING, P.E.
NYPE NO. 080339-1
EXPIRATION DATE 6/30/2011

SAT TO DATE

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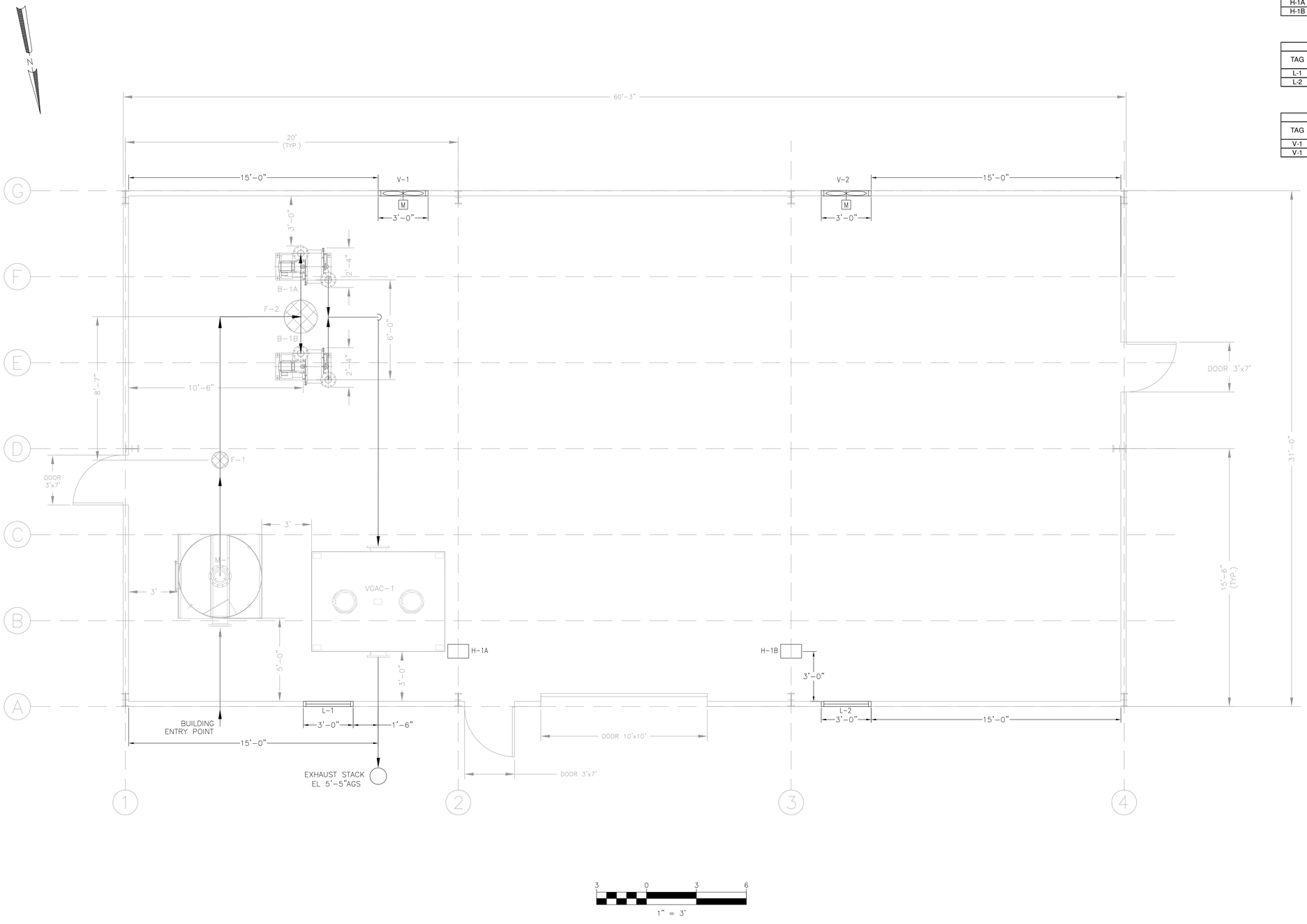

3 0 3 6

1" = 3'

UNIT HEATER SCHEDULE					
TAG	DIMENSIONS	POWER RATING	MOUNTING HEIGHT (AFF)	WEIGHT (LBS)	REMARKS
H-1A	13" X 9" X 16" HT	5 KW	10'	32	HORIZONTAL
H-1B	13" X 9" X 16" HT	5 KW	10'	32	HORIZONTAL

SEE NOTE 1

LOUVER SCHEDULE			
TAG	DIMENSIONS	MOUNTING HEIGHT (AFF)	REMARKS
L-1	3' X 3' X 4" DP	3'	
L-2	3' X 3' X 4" DP	3'	

SEE NOTE 2

VENTILATOR SCHEDULE					
TAG	DIMENSIONS	FLOWRATE	HORSEPOWER	MOUNTING HEIGHT (AFF)	REMARKS
V-1		1,000 CFM	1/4 HP	8'	WALL MOUNT
V-1		1,000 CFM	1/4 HP	8'	WALL MOUNT

SEE NOTE 3

NOTES:

1. UNIT HEATERS H-1A AND H-1B ARE HORIZONTAL BLOWER HEATER TYPE WITH ELECTRIC ELEMENTS, AND MOUNTED ON SUITABLE WALL MOUNTING BRACKET. UNIT HEATERS ARE 460V 3PH, AND INCLUDE A LOCAL DISCONNECT SWITCH, AND ADJUSTABLE THERMOSTAT SWITCH.
2. LOUVERS L-1 AND L-2 ARE FIXED BLADE WITH FRAME AND INSECT/BIRD SCREEN. EACH LOUVER INCLUDES ADJUSTABLE BAROMETRIC INTERIOR WALL DAMPERS. LOUVERS ARE CONSTRUCTED OF 0.08" THICK ALUMINUM.
3. VENTILATORS V-1 AND V-2 ARE WALL MOUNTED, DIRECT DRIVE TYPE FAN. VENTILATORS ARE 120V 1PH, AND INCLUDE A LOCAL DISCONNECT SWITCH, ADJUSTABLE THERMOSTAT, AND HAVE DAMPERS THAT CLOSE WHEN NOT IN OPERATION.

ABBREVIATIONS:

AFF	ABOVE FINISHED FLOOR
AGS	ABOVE GROUND SURFACE
HT	HEIGHT
DP	DEEP
CFM	CUBIC FEET PER MINUTE

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SUBMITTED BY: (TRM MEMBER) DR. EHSC: (DATE)
SOUTHWESTOW (TITLE) HD: HD: DIR: (DATE)
PM: ENG: OFFICER IN CHARGE DATE

DEPARTMENT OF THE NAVY
NAVAL FACILITIES ENGINEERING COMMAND, MID-ATLANTIC
NAVAL WEAPONS INDUSTRIAL RESERVE PLANT BETHPAGE, NEW YORK
SITE 1, FORMER DRUM MARSHALLING AREA
SOIL VAPOR EXTRACTION CONTAINMENT SYSTEM
HEATING AND VENTILATION LAYOUT AND DETAILS
APPROVED DATE

NAVAL FACILITIES ENGINEERING COMMAND, MID-ATLANTIC
EFANE FOR COMMANDER, NAVFAC
APPROVED DATE

SEAL AREA

STATE OF NEW YORK GEOFFREY P. KING 080139 LICENSED PROFESSIONAL ENGINEER

GEOFFREY P. KING, P.E.
NYPE NO. 080139-1
EXPIRATION DATE 6/30/2011

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VALVE AND PIPING SYMBOLS

- GLOBE VALVE
- GATE VALVE
- BUTTERFLY VALVE
- CHECK VALVE
- PLUG VALVE
- 3-WAY VALVE
- ANGLE VALVE
- RELIEF OR SAFETY VALVE
- DIAPHRAGM VALVE
- BALL VALVE
- SELF-CONTAINED PRESSURE REGULATING VALVE W/RELIEF
- KNIFE GATE VALVE
- BP BACKFLOW PREVENTER
- NO NORMALLY OPEN
- NC NORMALLY CLOSED
- SP SAMPLE PORT
- FLEXIBLE HOSE
- FLEXIBLE CONNECTOR
- CONSERVATION VENT
- BASKET TYPE STRAINER
- Y-TYPE STRAINER
- DUPLEX STRAINER
- SLEEVE COUPLING
- FLOOR DRAIN
- EQUIPMENT DRAIN
- CLEANOUT (CO)
- REMOVABLE PLUG
- REMOVABLE CAP
- BF BLIND FLANGE
- EXHAUST TO ATMOSPHERE (INSIDE)
- EXHAUST TO ATMOSPHERE (OUTSIDE)
- REDUCER
- FLANGE
- UNION
- QUICK DISCONNECT COUPLING
- GAUGE SEAL
- DAMPER
- FLAME ARRESTOR

VALVE OPERATOR SYMBOLS

- S SOLENOID
- M MOTOR, ELECTRIC
- DIAPHRAGM
- DIAPHRAGM WITH POSITIONER
- HANDWHEEL OR LEVER
- CHAINWHEEL

PRIMARY ELEMENT SYMBOLS – FLOW

- ORIFICE PLATE
- PITOT TUBE
- AVERAGING PITOT TUBE
- VENTURI OR FLOW TUBE
- TOTALIZING FLOWMETER
- FLUME
- WEIR
- TURBINE OR PROPELLER TYPE METER
- MAGNETIC FLOW METER
- ROTAMETER

EQUIPMENT SYMBOLS

- SUBMERSIBLE SUMP PUMP
- PUMP
- HAND OPERATED DIAPHRAGM PUMP
- M MIXER
- BLOWER
- FLOW DAMPENER
- VSD VARIABLE SPEED DRIVE
- PARTICULATE FILTER
- AIR FILTER/SILENCER

GENERAL INSTRUMENT AND HMI SYMBOLS

ONE VARIABLE	TWO VARIABLES	
○	○○	LOCALLY MOUNTED
⊖	⊖⊖	PANEL MOUNTED
⊖	⊖⊖	REAR-OF-PANEL MOUNTED
I		INTERLOCK (FOR LOGIC DESCRIPTION SEE SPEC. 13600)
P		PURGE
PLC		PROGRAMMABLE LOGIC CONTROLLER
LSL		PERSONAL COMPUTER SOFT SWITCH
▭		PERSONAL COMPUTER HUMAN MACHINE INTERFACE
○		PERSONAL COMPUTER
A		ALARM

LINE SYMBOLS

- PROCESS PIPES OR CHANNELS
- HEAT TRACE
- CONNECTION TO PROCESS, MECHANICAL LINK OR INSTRUMENT SUPPLY
- PNEUMATIC SIGNAL
- ELECTRIC SIGNAL
- CAPILLARY TUBING (FILLED SYSTEM)
- HYDRAULIC SIGNAL
- ELECTROMAGNETIC OR SONIC SIGNAL NO WIRING OR TUBING
- DATA HIGHWAY SIGNAL

INSTRUMENT IDENTIFICATION TABLE

	FIRST LETTER		SUCCEEDING LETTERS		
	MEASURED OR INITIATING VARIABLE	MODIFIER	READOUT OR PASSIVE FUNCTION	OUTPUT FUNCTION	MODIFIER
A	ANALYSIS		ALARM		AUTO
B	BURNER FLAME				
C	CONDUCTIVITY		CLOSE	CONTROL	
D	DENSITY (SP. GR.)	DIFFERENTIAL			
E	VOLTAGE		PRIMARY ELEMENT		
F	FLOWRATE	RATIO			
G	GAUGING (DIMENSIONAL)		GLASS		
H	HAND (MANUAL)				HIGH
I	CURRENT		INDICATE		
J	POWER	SCAN			
K	TIME OR SCHEDULE			CONTROL SWITCH	
L	LEVEL		LIGHT (PILOT)		LOW
M	MOISTURE OR HUMIDITY				MIDDLE
N					
O	OPEN		ORIFICE		
P	PRESSURE OR VACUUM		POINT (TEST)		
Q	QUANTITY OR EVENT	INTEGRATE			
R	RADIOACTIVITY		RECORD OR PRINT		
S	SPEED OR FREQUENCY	SAFETY		SWITCH	
T	TEMPERATURE			TRANSMIT	
U	MULTIVARIABLE		MULTIFUNCTION		
V	VISCOSITY			VALVE OR DAMPER	
W	WEIGHT OR FORCE		WELL		
X	UNCLASSIFIED		UNCLASSIFIED		
Y				RELAY OR COMPUTE	
Z	POSITION			DRIVE ACTUATE	

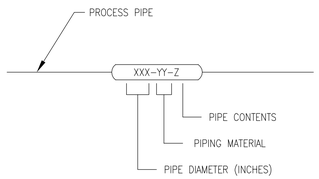
PROCESS LINE ABBREVIATIONS

AIR	AIR, ATMOSPHERIC PRESSURE
BW	BACKWASH
BA	BUTYL ALCOHOL
CF	CHEMICAL FEED
CO2	CARBON DIOXIDE
CR	CONDENSATE RETURN
CWR	CHILLED WATER RETURN
CWS	CHILLED WATER SEND
D	DRAIN
EFF	EFFLUENT
EXH	EXHAUST
IA	INSTRUMENT AIR
P	PRODUCT
PROP	PROPANE
PW	POTABLE WATER
S	SANITARY
SL	SLUDGE
SP	SAMPLE PORT
STM	STEAM SUPPLY
TF	TOTAL FLUIDS
V	VAPOR

PIPING MATERIAL ABBREVIATIONS

ABS	ACRYLONITRILE BUTADIENE STYRENE
AL	ALUMINUM
CPVC	CHLORINATED POLYVINYL CHLORIDE
CS	CARBON STEEL
COP	COPPER
CMP	CORRUGATED METAL PIPE
CIP	CAST IRON PIPE
DIP	DUCTILE IRON PIPE
FLEX	FLEXIBLE PIPE/DUCT/TUBING
GALV	GALVANIZED STEEL
HDPE	HIGH DENSITY POLYETHYLENE
NEO	NEOPRENE HOSE
PE	POLYETHYLENE
PP	POLYPROPYLENE
PVC	POLYVINYL CHLORIDE
RCP	REINFORCED CONCRETE PIPE
RUB	RUBBER HOSE
SS	STAINLESS STEEL PIPE/TUBING
TEF	TEFLON TUBING
VCP	VITRIFIED CLAY PIPE

PROCESS PIPING IDENTIFICATION



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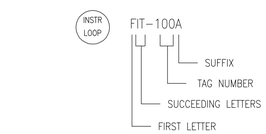

FUNCTION ABBREVIATIONS

DO	DISSOLVED OXYGEN	OC	OPEN-CLOSE
FC	FAIL CLOSED	OO	ON-OFF (MAINTAINED)
FL	FAIL LOCKED	ORP	OXIDATION REDUCTION POTENTIAL
FO	FAIL OPEN	OSC	OPEN-STOP-CLOSE (MOMENTARY)
HOA	HAND-OFF-AUTOMATIC	SI	MOTOR SPEED INDICATION
I/I	CURRENT-TO-CURRENT	SS	START-STOP (MOMENTARY)
I/P	CURRENT-TO-PNEUMATIC	↑	HIGH SELECT
LCP	LOCAL CONTROL PANEL	↓	LOW SELECT
LEL	LOWER EXPLOSIVE LIMIT	√	SQUARE ROOT
LR	LOCAL-REMOTE	Σ	ADD OR TOTALIZE
MI	MOTOR RUN INDICATION		

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SUBMITTED BY: (TTEM MEMBER) SOUTHWESTON HD. DIR. PIC: OFFICER IN CHARGE
DATE APPROVED

DEPARTMENT OF THE NAVY
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NAVAL WEAPONS INDUSTRIAL RESERVE PLANT BETHPAGE, NEW YORK
SITE 1, FORMER DRUM MARSHALLING AREA
SOIL VAPOR EXTRACTION CONTAINMENT SYSTEM
PIPING AND INSTRUMENTATION LEGEND
NAVAL FACILITIES ENGINEERING COMMAND
NAVFAC
DATE
EFANE FOR COMMANDER, MAFAC

SEAL AREA
STATE OF NEW YORK
GEOFFREY P. KING
No. 065078
LICENSED PROFESSIONAL ENGINEER
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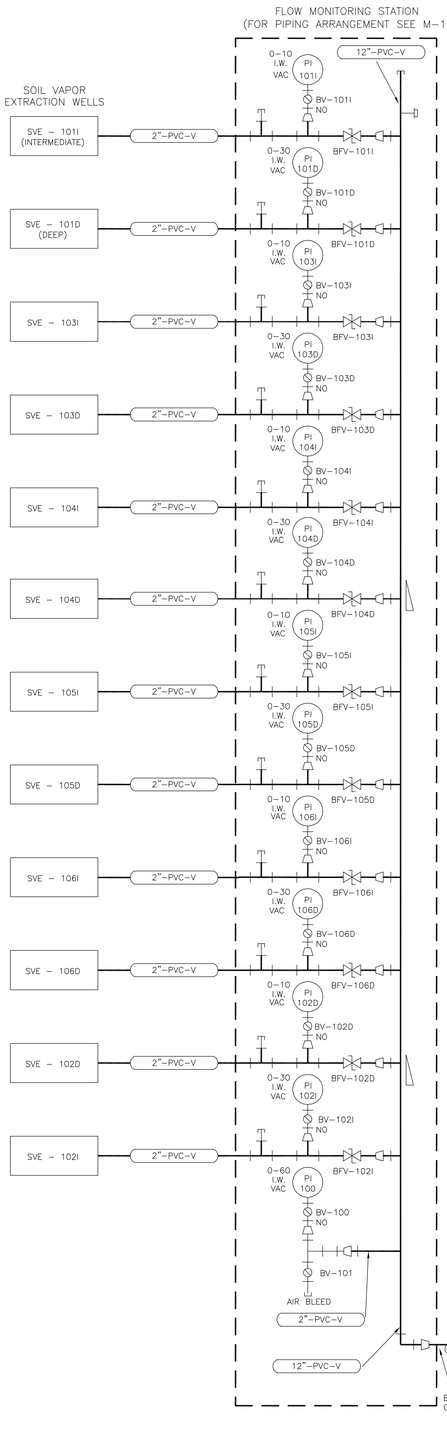
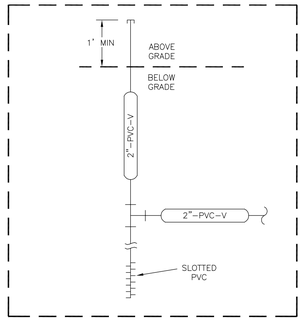
SPEC. NO.
CONSTRN. CONTR. NO. N62473-10-D-3211
NAVFAC DRAWING NO.

SHEET OF
SIZE: D
DIS. SH. NO. P-1



TYPICAL SOIL VAPOR
EXTRACTION WELL PIPING
(FOR WELL INSTALLATION DETAILS, NOTE 3)



NOTES:

1. THE BASIS OF DESIGN AND REMEDIAL OBJECTIVES FOR THE SVE CONTAINMENT SYSTEM CAN BE FOUND IN "DESIGN ANALYSIS REPORT FOR SOIL VAPOR EXTRACTION CONTAINMENT SYSTEM" (TTNUS, APRIL 2009)

1. FLOW MONITOR PORTS HAVE A 1" NPT AND CONNECTED TO THE MAIN PROCESS PIPING BY USE OF T-CONNECTION. FLOW MONITOR PORTS HAVE AN AIR TIGHT NPT CAP.

3. ALL WELL HEAD ASSEMBLIES ARE SIMILAR CONSTRUCTION. SEE DRAWING C-5 FOR INSTALLATION DETAILS.

4. ALL UNDERGROUND PIPING HAS SLOPE TOWARD CONDENSATE CLEANOUT PORTS. CONDENSATE CLEANOUT PORTS ARE LOCATED AS IDENTIFIED ON DRAWING C-2. CLEANOUT PORTS HAVE AN AIR TIGHT CAP. SEE DRAWING C-5 FOR INSTALLATION DETAILS.

5. SAMPLE PORT AND AIR BLEED PORTS ARE 1" NPT AND CONNECTED TO THE MAIN PROCESS PIPING BY USE OF 1" NPT GALVANIZED PIPE NIPPLE, 1" NPT BRASS BALL VALVE, 1" NPT GALVANIZED PIPE NIPPLE, 1"X2" REDUCER BUSHING AND 10"X10"X2" T-CONNECTION. SAMPLE PORTS AND AIR BLEED PORTS HAVE AN AIR TIGHT NPT CAP.

6. PRESSURE INDICATORS ARE 1/2" NPT AND CONNECTED TO THE MAIN PROCESS PIP'ING BY USE OF 1/2" NPT GALVANIZED PIPE NIPPLE, 1/2" NPT BRASS BALL VALVE, 1/2" NPT GALVANIZED PIPE NIPPLE, 1"X2" REDUCER BUSHING AND 10"X10"X2" T-CONNECTION.

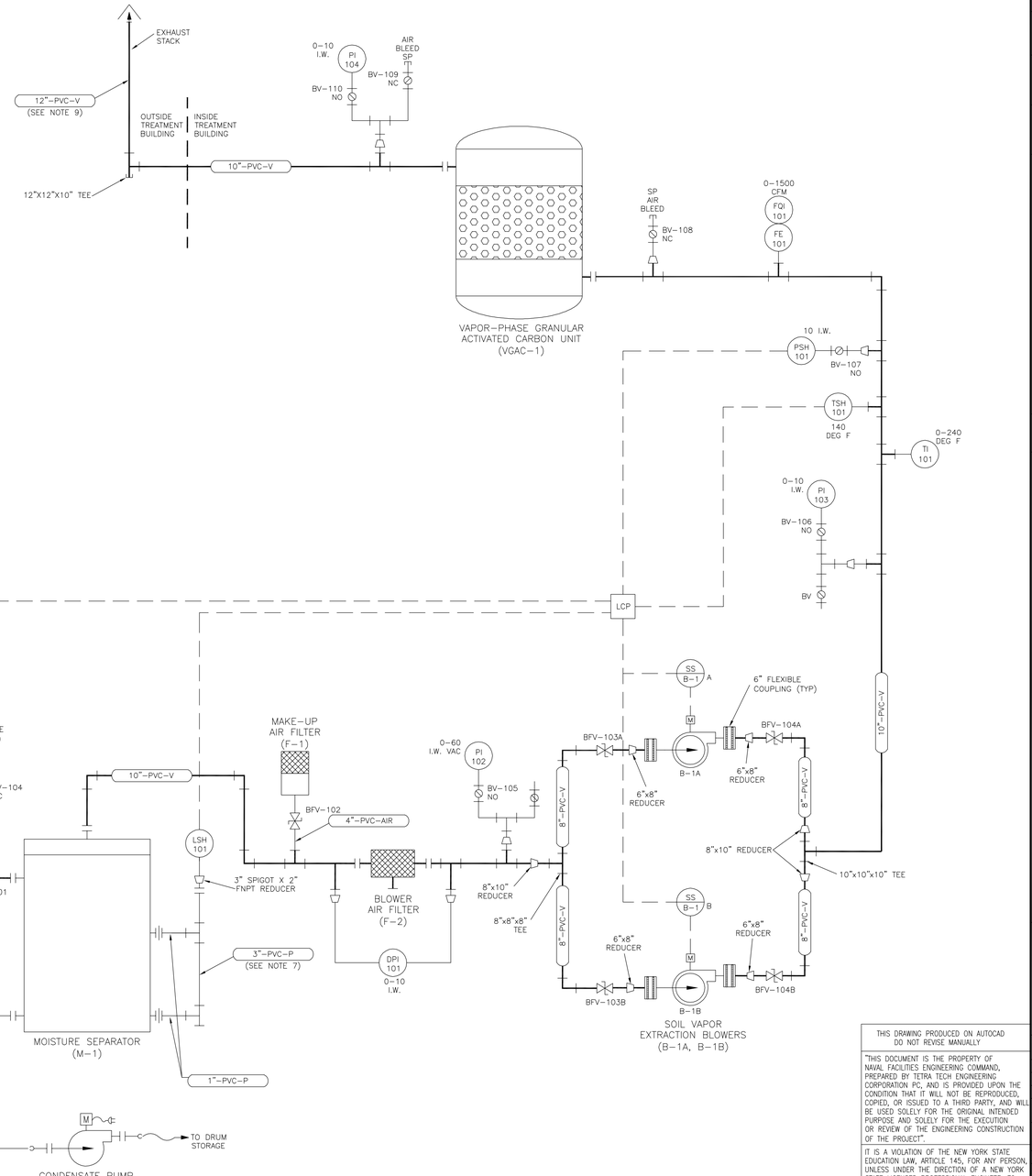
7. SIGHT TUBE IS CONSTRUCTED OF 3" DIAMETER CLEAR PVC PIPE.

8. ALL PIPING IS SCHEDULE 40 PVC, UNLESS OTHERWISE NOTED.

9. EXHAUST STACK IS CONSTRUCTED OF 12" SCHEDULE 80 PVC AND EXTENDS ABOVE ROOFLINE.

10. INSTRUMENTS HAVE AN ADJUSTABLE RANGE BETWEEN 0-75 I.W.

11. ABOVE GROUND PIPING THAT IS OUTSIDE IS INSULATED, INCLUDING PIPING WITHIN THE FLOW MONITORING STATION.



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1	RECORD DRAWING	DB	6-2-10	GPK	

TETRA TECH ENGINEERING CORPORATION PC

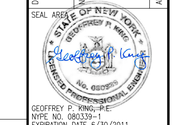
DSGN. BK | DR. BMV | CH. ENG. | CHK. SP | (TITLE) | (DATE)
SUPV.
SUBMITTED BY: (TYPED NAME/SIGN) | SOUTHWESTDIV | NAVFAC | HQ: | HQ: | DIR: | FPE: | OFFICER IN CHARGE | DATE
APPROVED | DATE

DEPARTMENT OF THE NAVY
NAVAL FACILITIES ENGINEERING COMMAND, MID-ATLANTIC
NAVAL WEAPONS INDUSTRIAL RESERVE PLANT | BETHPAGE, NEW YORK

SITE 1, FORMER DRUM MARSHALLING AREA
SOIL VAPOR EXTRACTION CONTAINMENT SYSTEM
PIPING AND INSTRUMENTATION DIAGRAM

APPROVED | DATE
EFANE FOR COMMANDER, NAVFAC

SEAL AREA



GEOFFREY P. KING, P.E.
NYPE NO. 080339-1
EXPIRATION DATE 6/30/2011

SAT TO | DATE

CODE I.D. NO.

SCALE : AS SHOWN

SPEC. NO.

CONSTRN. CONTR. NO.
N62473-10-D-3211

NAVFAC DRAWING NO.

SHEET | OF

SIZE: D | DIS. SH. NO. P-2

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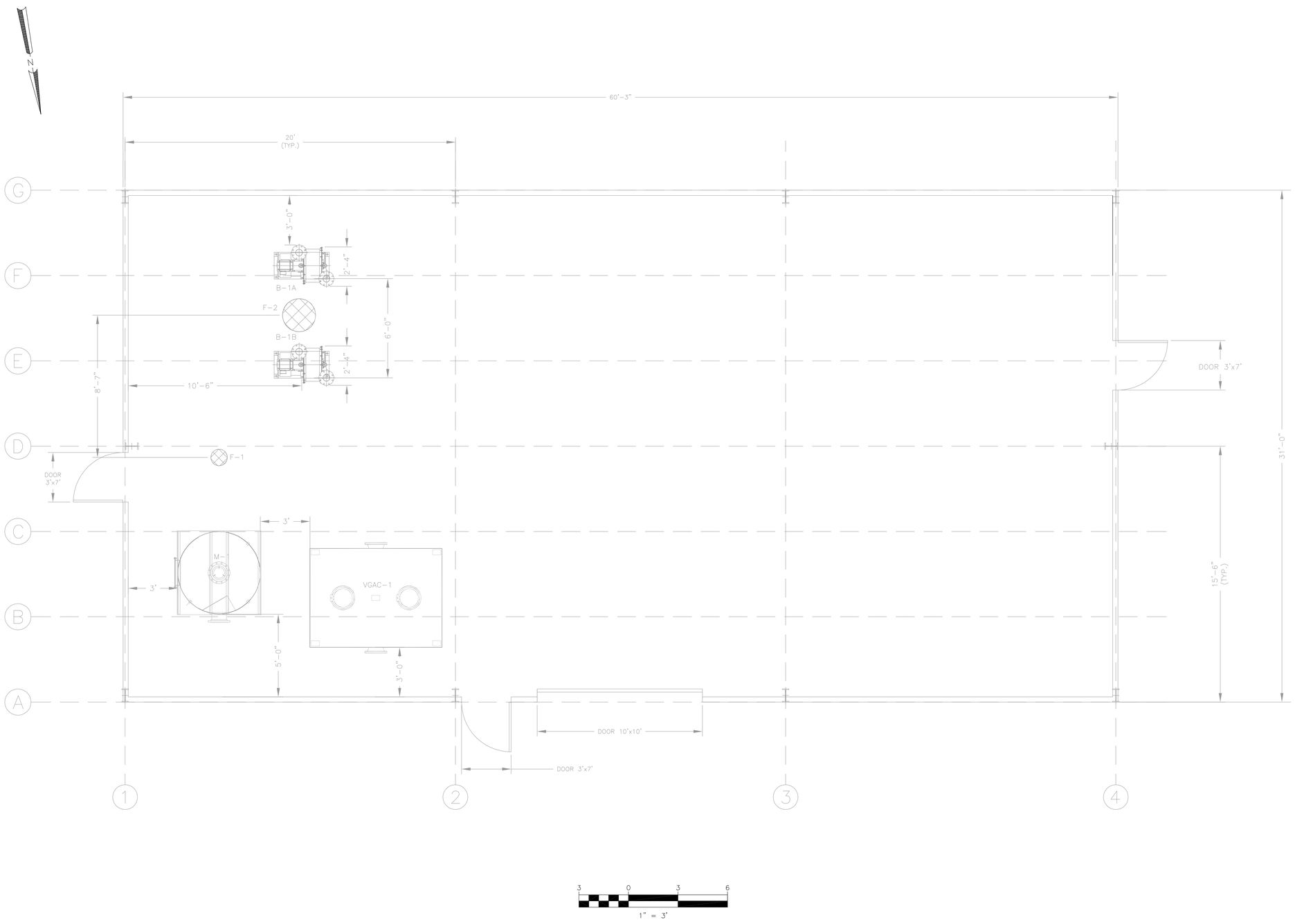
NOTES:

1. ALL MAN DOORS AND OVERHEAD DOORS ARE EXISTING. MAN DOORS ARE APPROXIMATELY 7'X3'. OVERHEAD DOOR IS APPROXIMATELY 10'X10'.



PROCESS EQUIPMENT LIST		
ITEM NUMBER	NUMBER REQUIRED	NAME/DESCRIPTION
M-1	1	MOISTURE SEPARATOR -CONFIGURATION: VERTICAL, CYLINDRICAL -MATERIAL OF CONSTRUCTION: CARBON STEEL, EPOXY INTERIOR COATING, PAINT EXTERIOR COATING -CAPACITY: 400 GALLON CONDENSATE COLLECTION -DIMENSIONS: 5 FT DIA X 6 FEET HT, 718 GALLON
F-1	1	MAKE-UP AIR FILTER -CONFIGURATION: INTAKE FILTER/SILENCER COMBINATION HOUSING -MATERIAL OF CONSTRUCTION: CARBON STEEL, CORROSION RESISTANCE COATING -CAPACITY: 500 CFM AT 20 IW, 4 INCH FLANGED CONNECTION
F-2	1	BLOWER AIR FILTER -CONFIGURATION: INLINE VACUUM SERVICE FILTER -MATERIAL OF CONSTRUCTION: CARBON STEEL, CORROSION RESISTANCE COATING -CAPACITY: 1,200 CFM AT 35 IW, 10 INCH FLANGED CONNECTION
B-1A, B-1B	2	SOIL VAPOR EXTRACTION BLOWER -CONFIGURATION: HORIZONTAL CENTRIFUGAL -RATING: 600 CFM AT 40 IW -MOTOR: 7.5 HP, 460V, 3PH, 60HZ, ODP
VGAC-1	1	VAPOR-PHASE GRANULAR ACTIVATED CARBON -CONFIGURATION: RECTANGULAR TANK -MATERIAL OF CONSTRUCTION: CARBON STEEL, EPOXY INTERIOR COATING, EPOXY EXTERIOR COATING -RATING: 1,600 CFM AT 3 IW, 2,000 CFM AT 6 IW -CAPACITY: 5,000 LBS CARBON -DIMENSIONS: 6' X 8' FOOTPRINT, 6' 8" HT

TETRA TECH ENGINEERING CORPORATION PC

DSGN: BK DR: BMV CHK: SP
SUPV: CH ENG:
SUBMITTED BY: (FIRM MEMBER) (TITLE) (DATE)
SOUTHWESTDIV DM: HO: HO: PPE: DIR:
OFFICER IN CHARGE
APPROVED DATE

REV	DESCRIPTION	PREP BY	DATE	APPRVD
0	ISSUED FOR CONSTRUCTION	DLB	10-14-09	SGP
1	RECORD DRAWING	DB	6-2-10	GPK

DEPARTMENT OF THE NAVY
NAVAL FACILITIES ENGINEERING COMMAND, MID-ATLANTIC
NAVAL FACILITIES ENGINEERING COMMAND
NAVAL WEAPONS INDUSTRIAL RESERVE PLANT
BETHPAGE, NEW YORK

SITE 1, FORMER DRUM MARSHALLING AREA
SOIL VAPOR EXTRACTION CONTAINMENT SYSTEM
PROCESS EQUIPMENT LAYOUT AND DETAILS

APPROVED DATE EFANE FOR COMMANDER, NAVFAC

SEAL AREA

STATE OF NEW YORK
GEOFFREY P. KING
No. 080339
LICENSED PROFESSIONAL ENGINEER

GEOFFREY P. KING, P.E.
NYPE NO. 080339-1
EXPIRATION DATE 6/30/2011

SAT TO DATE

CODE I.D. NO.
SCALE : AS SHOWN
SPEC. NO.
CONSTRN. CONTR. NO. N62473-10-D-3211
NAVFAC DRAWING NO.
SHEET OF
SIZE: D
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A-6
MSDS

HOME OFFICE
1200 E. 26th ST
Anderson, IN 46016
508-631-3203 Phone
www.tetrasolv.com

REGIONAL OFFICE
POB 1034
Truth or Consequences, NM 87901
508-448-0256 Fax
jbarbour@tetrasolv.com

MATERIAL SAFETY DATA SHEET

Revision Date: 02/08

1.1 IDENTIFICATION OF PRODUCT.

Designation: - Activated carbon

1.2 COMPANY.

Tetrasolv Filtration
1200 E 26th St,
Anderson IN, 46016

Phone: 765-643-3941
Fax: (281) 331-2281
Emergency
Phone: 508-631-3203

2 HAZARDOUS AND OTHER INGREDIENTS.

Exposure limits may vary. It is recommended that information about locally applicable exposure limits be obtained.

%w/w	Compound	CAS No	MAK mg/m^3 (Germany)	TLV mg/m^3 (ACGIH)	PEL mg/m^3 (OSHA)
100	Bituminous Carbon	7440-44-0	T Dust	T dust	15 mg/m3

3 PHYSICAL DATA.

State:	Solid
Appearance:	Black granule, extradite, or powder
pH:	Not applicable
Boiling point or range:	Sublimes
Melting point or range:	3550 C (6422 F)
Vapor pressure:	1 @3586 C (6487 F)
Vapor density:	0.4
Density relative to water:	1.5 – 1.8 Specific gravity
Solubility in water:	Insoluble in water
Partition coefficient: (n-octanol/water):	
Other data:	odorless

4 FIRE AND EXPLOSION HAZARD DATA.

Fire, explosion and reactivity hazards:	Flammable.
Flammability and flammability limits:	Flammable.
Autoflammability:	Not applicable.
Explosive properties:	Non explosive.
Oxidizing properties:	Non oxidizing.

Fire fighting measures:

As with most organic solids, fire is possible at elevated temperatures or by contact with an ignition source.

Explosion:
Fine dust dispersed in air in sufficient concentrations, and in the presence of an ignition source is a potential dust explosion hazard. Minimum explosible concentration 0.140 g/l.

Fire Extinguishing Media:
Water or water spray.

Unusual Fire and Explosion Hazards:
Contact with strong oxidize such as ozone, liquid oxygen, chlorine, permanganate, etc., may result in fire.

Special Information:
In the event of a fire, wear full protective clothing and NIOSH-approved self-contained breathing apparatus with full facepiece operated in the pressure demand or other positive pressure mode.

5 STABILITY AND REACTIVITY DATA.

The product is stable under normal handling and storage conditions.

Conditions to avoid:	Incompatibilities.
Materials to avoid:	Liquid air and oxidizing materials. Strong oxidizers such as ozone, liquid oxygen, chlorine, permanganate, etc
Hazardous decomposition products:	Involvement in a fire causes formation of carbon dioxide and carbon monoxide.

Emergency Overview

WARNING! FLAMMABLE SOLID. ACTIVATED CARBON AFFECTS THE RESPIRATORY AND CARDIOVASCULAR SYSTEMS.

CAUTION!!! Wet activated carbon removes oxygen from air causing a severe hazard to workers inside carbon vessels and enclosed or confined spaces. Before entering such an area, sampling and work procedures for low oxygen levels should be taken to ensure ample oxygen availability, observing all local, state, and federal regulations.

J.T. Baker SAF-T-DATA(tm) Ratings (Provided here for your convenience)

Health Rating: 1 - Slight
Flammability Rating: 3 - Severe (Flammable)
Reactivity Rating: 1 - Slight
Contact Rating: 1 - Slight

Lab Protective Equip: GOGGLES; LAB COAT; CLASS B EXTINGUISHER
Storage Color Code: Orange (General Storage)

Potential Health Effects

Inhalation:
May cause mild irritation to the respiratory tract. The acute inhalation LC50 (Rat) is >64.4 mg/l (nominal concentration) for activated carbon.

Ingestion:
No adverse effects expected. May cause mild irritation to the gastrointestinal tract. The acute oral LD50 (Rat) is >10g/kg.

Skin Contact:
Not expected to be a health hazard from skin exposure. May cause mild irritation and redness. The primary skin irritation index (Rabbit) is 0.

Eye Contact:
No adverse effects expected. May cause mild irritation, possible reddening.

Chronic Exposure:
Prolonged inhalation of excessive dust may produce pulmonary disorders. The effects of long-term, low-level exposures to this product have not been determined. Safe handling of this material on a long-term basis should emphasize the avoidance of all effects from repetitive acute exposures.

Aggravation of Pre-existing Conditions:
No information found.

6. First Aid Measures

Inhalation:
Remove to fresh air. Get medical attention for any breathing difficulty.

Ingestion:
Give several glasses of water to drink to dilute. If large amounts were swallowed, seek medical attention.

Skin Contact:
Not expected to require first aid measures. Wash exposed area with soap and water. Seek medical attention if irritation develops.

Eye Contact:
Wash thoroughly with running water for at least 15 minutes. Seek medical attention if irritation develops.

7. Accidental Release Measures

Remove all sources of ignition. Ventilate area of leak or spill. Wear appropriate personal protective equipment as specified in Section 8. Spills: Clean up spills in a manner that does not disperse dust into the air. Use non-sparking tools and equipment. Reduce airborne dust and prevent scattering by moistening with water. Pick up spill for recovery or disposal and place in a closed container. Warning! Spent product may have absorbed hazardous materials.

8. Handling and Storage

Protect against physical damage. Store in a cool, dry well-ventilated location, away from any area where the fire hazard may be acute. Outside or detached storage is preferred. Separate from incompatibles. Containers should be bonded and grounded for transfers to avoid static sparks. Storage and use areas should be No Smoking areas. Use non-sparking type tools and equipment, including explosion proof ventilation. Containers of this material may be hazardous

when empty since they retain product residues (dust, solids); observe all warnings and precautions listed for the product.

CAUTION!! Wet activated carbon removes oxygen from air causing a severe hazard to workers inside carbon vessels and enclosed or confined spaces. Before entering such an area, sampling and work procedures for low oxygen levels should be taken to ensure ample oxygen availability, observing all local, state, and federal or national regulations.

9. Exposure Controls/Personal Protection

Exposure Guidelines:
OSHA PEL*:
5mg/M3 (Respirable)
ACGIH TLV*:
10 mg/M3 (Total)
*PELs and TLVs are 8-hour TWAs unless otherwise noted.

Ventilation System:
A system of local and/or general exhaust is recommended to keep employee exposures below the Airborne Exposure Limits. Local exhaust ventilation is generally preferred because it can control the emissions of the contaminant at its source, preventing dispersion of it into the general work area. Please refer to the ACGIH document, *Industrial Ventilation, A Manual of Recommended Practices*, most recent edition, for details.

Personal Respirators (NIOSH Approved):
For conditions of use where exposure to the dust or mist is apparent, a half-face dust/mist respirator may be worn. For emergencies or instances where the exposure levels are not known, use a full-face positive-pressure, air-supplied respirator. WARNING: Air-purifying respirators do not protect workers in oxygen-deficient atmospheres.

Skin Protection:
Wear protective gloves and clean body-covering clothing.

Eye Protection:
Use chemical safety goggles. Maintain eye wash fountain and quick-drench facilities in work area.

10. Toxicological Information

Investigated as a reproductive effector.

--------\Cancer Lists\----------			
	---NTP Carcinogen---		
Ingredient	Known	Anticipated	IARC Category
----------	-----	----------	----------
Activated Carbon (7440-44-0)	No	No	None

11. Ecological Information

Environmental Fate:
No information found.

Environmental Toxicity:
No information found.

12. Disposal Considerations

Whatever cannot be saved for recovery or recycling should be managed in an appropriate and approved waste disposal facility. Processing, use or contamination of this product may change the waste management options. State and local

disposal regulations may differ from federal disposal regulations. Dispose of container and unused contents in accordance with federal, state and local requirements.

13. Transport Information

Proper Shipping Name:
NOT REGULATED
Hazard Class:
N/A
Identification Number:
N/A
Packing Group:
N/A
This product has been tested according to the United Nations *Transport of Dangerous Goods* test protocol for spontaneously combustible materials. It has been specifically determined that this product does not meet the definition of a self heating substance or any hazard class, and therefore is not a hazardous material and not regulated.

14. Regulatory Information

SARA TITLE III:
N/A
TSCA:
The ingredients of this product are on the TSCA Inventory List.
OSHA:
Nonhazardous according to definitions of health hazard and physical hazard provided in the Hazard Communication Standard (29 CFR 1910.1200)
CANADA

WHMIS CLASSIFICATION:
Not Classified
DSL#:
6798
EEC
Council Directives relating to the classification, packaging, and labeling of dangerous substances and preparations.
Risk (R) and Safety (S) phrases:
May be irritating to eyes (R36).

15. Other Information

NFPA Ratings: Health: 0 **Flammability:** 1 **Reactivity:** 0

Label Hazard Warning:
WARNING! FLAMMABLE SOLID. ACTIVATED CARBON AFFECTS THE RESPIRATORY AND CARDIOVASCULAR SYSTEMS.

Label Precautions:
Keep away from heat, sparks and flame. Avoid contact with eyes, skin and clothing. Avoid breathing dust. Keep container closed. Use with adequate ventilation. Wash thoroughly after handling.

Label First Aid:
If inhaled, remove to fresh air. Get medical attention for any breathing difficulty.

Material Safety Data Sheets

Division of Facilities Services

DOD Hazardous Material Information (ANSI Format)
For Cornell University Convenience Only

TRICHLOROETHENE, 0-664

Section 1 - Product and Company Identification	Section 9 - Physical & Chemical Properties
Section 2 - Compositon/Information on Ingredients	Section 10 - Stability & Reactivity Data
Section 3 - Hazards Identification Including Emergency Overview	Section 11 - Toxicological Information
Section 4 - First Aid Measures	Section 12 - Ecological Information
Section 5 - Fire Fighting Measures	Section 13 - Disposal Considerations
Section 6 - Accidental Release Measures	Section 14 - MSDS Transport Information
Section 7 - Handling and Storage	Section 15 - Regulatory Information
Section 8 - Exposure Controls & Personal Protection	Section 16 - Other Information

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Section 1 - Product and Company Identification
TRICHLOROETHENE, 0-664

Product Identification: TRICHLOROETHENE, 0-664
Date of MSDS: 01/07/1993 **Technical Review Date:** 10/26/1994
FSC: 6810 **NIIN: LIIN:** 00N054683
Submitter: N EN
Status Code: C
MFN: 01
Article: N
Kit Part: N

Manufacturer's Information

Manufacturer's Name: CHEM SERVICE INC
Post Office Box: 3108
Manufacturer's Address1:
Manufacturer's Address2: WEST CHESTER, PA 19381
Manufacturer's Country: US
General Information Telephone: 215-692-3026
Emergency Telephone: 215-692-3026
Emergency Telephone: 215-692-3026
MSDS Preparer's Name: N/P
Proprietary: N
Reviewed: N
Published: Y
CAGE: 84898
Special Project Code: N

Contractor Information

Contractor's Name: CHEM SERVICE INC
Post Office Box: 3108
Contractor's Address1: N/K
Contractor's Address2: WEST CHESTER, PA 19381
Contractor's Telephone: 215-692-3026
Contractor's CAGE: 84898

Contractor Information

Contractor's Name: CHEM SERVICE, INC
Post Office Box: 599
Contractor's Address1: 660 TOWER LN
Contractor's Address2: WEST CHESTER, PA 19301-9650
Contractor's Telephone: 610-692-3026
Contractor's CAGE: 8Y898

Section 2 - Compositon/Information on Ingredients
TRICHLOROETHENE, 0-664

Ingredient Name: ETHYLENE, TRICHLORO-; (TRICHLOROETHYLENE) (SARA III). LD50: (ORAL,RAT) 4920 MG/KG.
Ingredient CAS Number: 79-01-6 **Ingredient CAS Code:** M
RTECS Number: KX4550000 **RTECS Code:** M
=WT: =WT Code:
=Volume: =Volume Code:
>WT: >WT Code:
>Volume: >Volume Code:
<WT: <WT Code:
<Volume: <Volume Code:
% Low WT: % Low WT Code:
% High WT: % High WT Code:
% Low Volume: % Low Volume Code:

% High Volume: % High Volume Code:
% Text: N/K
% Enviromental Weight:
Other REC Limits: N/K
OSHA PEL: 100 PPM **OSHA PEL Code:** M
OSHA STEL: OSHA STEL Code:
ACGIH TLV: 50 PPM;100 STEL **ACGIH TLV Code:** M
ACGIH STEL: N/P **ACGIH STEL Code:**
EPA Reporting Quantity: 100 LBS
DOT Reporting Quantity: 100 LBS
Ozone Depleting Chemical: N

Ingredient Name: OTHER PREC:CAUSE THE FORMATION OF HCL &/OR PHOSGENE (FP N).
Ingredient CAS Number: Ingredient CAS Code: X
RTECS Number: 9999999ZZ **RTECS Code:** M
=WT: =WT Code:
=Volume: =Volume Code:
>WT: >WT Code:
>Volume: >Volume Code:
<WT: <WT Code:
<Volume: <Volume Code:
% Low WT: % Low WT Code:
% High WT: % High WT Code:
% Low Volume: % Low Volume Code:
% High Volume: % High Volume Code:
% Text: N/K
% Enviromental Weight:
Other REC Limits: N/K
OSHA PEL: NOT APPLICABLE **OSHA PEL Code:** M
OSHA STEL: OSHA STEL Code:
ACGIH TLV: NOT APPLICABLE **ACGIH TLV Code:** M
ACGIH STEL: N/P **ACGIH STEL Code:**
EPA Reporting Quantity:
DOT Reporting Quantity:
Ozone Depleting Chemical:

Ingredient Name: SUPDAT:BY MD/TRAINED EMERGENCY PERSONNEL. MEDICAL ADVICE CAN BE OBTAINED FROM A POISON CONTROL CENTER.
Ingredient CAS Number: Ingredient CAS Code: X
RTECS Number: 9999999ZZ **RTECS Code:** M
=WT: =WT Code:
=Volume: =Volume Code:
>WT: >WT Code:
>Volume: >Volume Code:
<WT: <WT Code:
<Volume: <Volume Code:
% Low WT: % Low WT Code:
% High WT: % High WT Code:
% Low Volume: % Low Volume Code:
% High Volume: % High Volume Code:
% Text: N/K

% Enviromental Weight:
Other REC Limits: N/K
OSHA PEL: NOT APPLICABLE **OSHA PEL Code:** M
OSHA STEL: OSHA STEL Code:
ACGIH TLV: NOT APPLICABLE **ACGIH TLV Code:** M
ACGIH STEL: N/P **ACGIH STEL Code:**
EPA Reporting Quantity:
DOT Reporting Quantity:
Ozone Depleting Chemical:

Section 3 - Hazards Identification, Including Emergency Overview
TRICHLOROETHENE, 0-664

Health Hazards Acute & Chronic: ALL CHEMS SHOULD BE CONSIDERED HAZ - AVOID DIRECT PHYSICAL CONT! SUSPECTED CARCIN - MAY PRDCE CANCER. MAY BE HARMFUL IF ABSORBED THRU SKIN, INHALED/SWALLOWED. LACHRYMATOR - CAUSES SEV EYE IRRIT. VAPS &/OR DIRECT EYE CONT CAN CAUSE SEV EYE BURNS. CAN CAUSE SKIN/EYE IRRIT. CAUSE CAUSE SKIN BURNS. CAN (EFTS OF OVEREXP)

Signs & Symptoms of Overexposure:
HLTH HAZ:CAUSE SEV SKIN BURNS. EXPOS CAN CAUSE LIVER/KIDNEY DMG. CAN CAUSE GI DISTURBS. CAN BE IRRIT TO MUC MEMBS. PRLNG EXPOS MAY CAUSE NAUS, HDCH, DIZZ &/OR EYE DMG. CAN CAUSE SENSIT BY SKIN CONT. C HLOROCARBON MATLS HAVE PRDCD SENSIT OF MYOCARDIUM TO EPINEPHRINE IN LAB ANIMALS & COULD HAVE SIMILAR EFT IN (SUPP DATA)

Medical Conditions Aggravated by Exposure:
NONE SPECIFIED BY MANUFACTURER.

LD50 LC50 Mixture: SEE INGREDIENT.

Route of Entry Indicators:
- **Inhalation:** YES
- **Skin:** YES
- **Ingestion:** YES

Carcenogenicity Indicators
- **NTP:** NO
- **IARC:** NO
- **OSHA:** NO

Carcinogenicity Explanation: NOT RELEVANT

Section 4 - First Aid Measures
TRICHLOROETHENE, 0-664

First Aid:
INGEST:CALL MD IMMED (FP N). EYES:FLUSH CONTINUOUSLY W/WATER FOR AT LST 15-20 MINS. SKIN:FLUSH W/WATER FOR 15-20 MINS. IF NO BURNS HAVE OCCURRED - USE SOAP & WATER TO CLEANSE SKIN. INHAL:REMOVE PATIEN T TO FRESH AIR. ADMIN

OXYGEN IF PATIENTIS HAVING DFCLTY BRTHG. IF PATIENT HAS STOPPED BRTHG ADMIN ARTF RESP. IF PATIENT IS IN CARDIAC ARREST ADMIN CPR. CONTINUE LIFE SUPPORTING MEASURES UNTIL(SUPDAT)

Section 5 - Fire Fighting Measures
TRICHLOROETHENE, 0-664

Fire Fighting Procedures:
USE NIOSH/MSHA APPROVED PRESSURE DEMAND SCBA & FULL PROTECTIVE EQUIPMENT (FP N).
Unusual Fire or Explosion Hazard:
THERMAL DECOMPOSITION PRODUCTS MAY INCLUDE HCL & PHOSGENE (FP N).
Extinguishing Media:
CARBON DIOXIDE, DRY CHEMICAL POWDER OR SPRAY.
Flash Point: Flash Point Text: NON-FLAMMABLE

Autoignition Temperature:
Autoignition Temperature Text: N/A
Lower Limit(s): 11%
Upper Limit(s): 41%

Section 6 - Accidental Release Measures
TRICHLOROETHENE, 0-664

Spill Release Procedures:
EVACUATE AREA. WEAR APPROPRIATE OSHA REGULATED EQUIPMENT. VENTILATE AREA. ABSORB ON VERMICULITE OR SIMILAR MATERIAL. SWEEP UP & PLACE IN AN APPROPRIATE CONTAINER. HOLD FOR DISPOSAL. WASH CONTAMINATED SURFACES TO REMOVE ANY RESIDUES.

Section 7 - Handling and Storage
TRICHLOROETHENE, 0-664

Handling and Storage Precautions:

Other Precautions:

Section 8 - Exposure Controls & Personal Protection
TRICHLOROETHENE, 0-664

Repiratory Protection:
NIOSH/MSHA APPROVED RESPIRATOR APPROPRIATE FOR EXPOSURE OF CONCERN (FP N).
Ventilation:
THIS CHEMICAL SHOULD ONLY BE HANDLED IN A HOOD.
Protective Gloves:
IMPERVIOUS GLOVES (FP N).
Eye Protection: ANSI APPROVED CHEM WORKERS GOGGS (FP N).
Other Protective Equipment: USE APPROPRIATE NIOSH/MSHA APPROVED SAFETY EQUIPMENT.

Work Hygenic Practices: CONTACT LENSES SHOULD NOT BE WORN IN THE LABORATORY. ANSI APPRVD EYE WASH & DELUGE SHOWER (FP N).
Supplemental Health & Safety Information: EFTS OF OVEREXP:HUMANS. ADRENOMIMETICS (E.G., EPINEPRHINE) MAY BE CONTRAINDICATED EXCEPT FOR LIFE-SUSTAINING USES IN HUMANS ACUTELY/CHRONICALLY EXPOS TO CHLOROCARBONS (FP N). FIRST AID PROC:MED ASSIST ANCE HAS ARRIVED. NOTE:AN ANTIDOTE IS ASUBSTANCE INTENDED TO COUNTERACT EFT OF A POIS. IT SHOULD BE ADMIN ONLY (ING 2)

Section 9 - Physical & Chemical Properties
TRICHLOROETHENE, 0-664

HCC:
NRC/State License Number:
Net Property Weight for Ammo:
Boiling Point: Boiling Point Text: 189F,87C
Melting/Freezing Point: Melting/Freezing Text: -125F,-87C
Decomposition Point: Decomposition Text: N/K
Vapor Pressure: 58 @ 20C **Vapor Density:** N/K
Percent Volatile Organic Content:
Specific Gravity: 1.462
Volatile Organic Content Pounds per Gallon:
pH: N/K
Volatile Organic Content Grams per Liter:
Viscosity: N/P
Evaporation Weight and Reference: N/K
Solubility in Water: INSOL (IMMISCIBLE)
Appearance and Odor: COLORLESS LIQUID.
Percent Volatiles by Volume: N/K
Corrosion Rate: N/K

Section 10 - Stability & Reactivity Data
TRICHLOROETHENE, 0-664

Stability Indicator: YES
Materials to Avoid:
INCOMPATIBLE W/STRONG BASES, STRONG OXIDIZING AGENTS.
Stability Condition to Avoid:
NONE SPECIFIED BY MANUFACTURER.
Hazardous Decomposition Products:
DECOMPOSITION LIBERATES TOXIC FUMES. DECOMPOSTION PRODUCTS ARE CORROSIVE. VOLATILE. HCL, PHOSGENE (FP N).
Hazardous Polymerization Indicator: NO
Conditions to Avoid Polymerization:
NOT RELEVANT

Section 11 - Toxicological Information
TRICHLOROETHENE, 0-664

Toxicological Information:
N/P

Section 12 - Ecological Information

TRICHLOROETHENE, 0-664

Ecological Information:
N/P

Section 13 - Disposal Considerations
TRICHLOROETHENE, 0-664

Waste Disposal Methods:
DISPOSAL MUST BE I/A/W FEDERAL, STATE & LOCAL REGULATIONS (FP N). BURN IN A CHEMICAL INCINERATOR EQUIPPED W/AFTERBURNER & SCRUBBER.

Section 14 - MSDS Transport Information
TRICHLOROETHENE, 0-664

Transport Information:
N/P

Section 15 - Regulatory Information
TRICHLOROETHENE, 0-664

SARA Title III Information:
N/P
Federal Regulatory Information:
N/P
State Regulatory Information:
N/P

Section 16 - Other Information
TRICHLOROETHENE, 0-664

Other Information:
N/P

HAZCOM Label Information

Product Identification: TRICHLOROETHENE, 0-664
CAGE: 84898
Assigned Individual: N
Company Name: CHEM SERVICE INC
Company PO Box: 3108
Company Street Address1: N/K
Company Street Address2: WEST CHESTER, PA 19381 US
Health Emergency Telephone: 215-692-3026
Label Required Indicator: Y
Date Label Reviewed: 10/26/1994
Status Code: C
Manufacturer's Label Number:
Date of Label: 10/26/1994
Year Procured: N/K
Organization Code: G
Chronic Hazard Indicator: Y
Eye Protection Indicator: YES
Skin Protection Indicator: YES

Respiratory Protection Indicator: YES
Signal Word: DANGER
Health Hazard: Moderate
Contact Hazard: Severe
Fire Hazard: None
Reactivity Hazard: None

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Material Safety Data Sheets

Division of Facilities Services

DOD Hazardous Material Information (ANSI Format)
For Cornell University Convenience Only

TETRACHLOROETHENE, 0-663

Section 1 - Product and Company Identification	Section 9 - Physical & Chemical Properties
Section 2 - Compositon/Information on Ingredients	Section 10 - Stability & Reactivity Data
Section 3 - Hazards Identification Including Emergency Overview	Section 11 - Toxicological Information
Section 4 - First Aid Measures	Section 12 - Ecological Information
Section 5 - Fire Fighting Measures	Section 13 - Disposal Considerations
Section 6 - Accidental Release Measures	Section 14 - MSDS Transport Information
Section 7 - Handling and Storage	Section 15 - Regulatory Information
Section 8 - Exposure Controls & Personal Protection	Section 16 - Other Information

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Cornell University does not in any way warrant or imply the applicability, viability or use of this information to any person or for use in any situation.

Section 1 - Product and Company Identification
TETRACHLOROETHENE, 0-663

Product Identification: TETRACHLOROETHENE, 0-663
Date of MSDS: 07/01/1988 **Technical Review Date:** 11/03/1994
FSC: 6810 **NIIN: LIIN:** 00N054677
Submitter: N EN
Status Code: C
MFN: 01
Article: N
Kit Part: N

Manufacturer's Information

Manufacturer's Name: CHEM SERVICE INC
Post Office Box: 3108
Manufacturer's Address1:
Manufacturer's Address2: WEST CHESTER, PA 19381
Manufacturer's Country: US
General Information Telephone: 215-692-3026
Emergency Telephone: 215-692-3026
Emergency Telephone: 215-692-3026
MSDS Preparer's Name: N/P
Proprietary: N
Reviewed: N
Published: Y
CAGE: 84898
Special Project Code: N

Contractor Information

Contractor's Name: CHEM SERVICE INC
Post Office Box: 3108
Contractor's Address1: N/K
Contractor's Address2: WEST CHESTER, PA 19381
Contractor's Telephone: 215-692-3026
Contractor's CAGE: 84898

Contractor Information

Contractor's Name: CHEM SERVICE, INC
Post Office Box: 599
Contractor's Address1: 660 TOWER LN
Contractor's Address2: WEST CHESTER, PA 19301-9650
Contractor's Telephone: 610-692-3026
Contractor's CAGE: 8Y898

Section 2 - Compositon/Information on Ingredients
TETRACHLOROETHENE, 0-663

Ingredient Name: ETHYLENE, TETRACHLORO-; (TETRACHLOROETHYLENE) (SARA III)
Ingredient CAS Number: 127-18-4 **Ingredient CAS Code:** M
RTECS Number: KX3850000 **RTECS Code:** M
=WT: =WT Code:
=Volume: =Volume Code:
>WT: >WT Code:
>Volume: >Volume Code:
<WT: <WT Code:
<Volume: <Volume Code:
% Low WT: % Low WT Code:
% High WT: % High WT Code:
% Low Volume: % Low Volume Code:
% High Volume: % High Volume Code:

% Text: N/K
% Enviromental Weight:
Other REC Limits: N/K
OSHA PEL: 25 PPM **OSHA PEL Code:** M
OSHA STEL: OSHA STEL Code:
ACGIH TLV: 25 PPM;100 PPM STEL **ACGIH TLV Code:** M
ACGIH STEL: N/P **ACGIH STEL Code:**
EPA Reporting Quantity: 100 LBS
DOT Reporting Quantity: 100 LBS
Ozone Depleting Chemical: N

Ingredient Name: EYE PROTECTION: FULL LENGTH FACESHIELD (FP N).
Ingredient CAS Number: Ingredient CAS Code: X
RTECS Number: 9999999ZZ **RTECS Code:** M
=WT: =WT Code:
=Volume: =Volume Code:
>WT: >WT Code:
>Volume: >Volume Code:
<WT: <WT Code:
<Volume: <Volume Code:
% Low WT: % Low WT Code:
% High WT: % High WT Code:
% Low Volume: % Low Volume Code:
% High Volume: % High Volume Code:
% Text: N/K
% Enviromental Weight:
Other REC Limits: N/K
OSHA PEL: N/K (FP N) **OSHA PEL Code:** M
OSHA STEL: OSHA STEL Code:
ACGIH TLV: N/K (FP N) **ACGIH TLV Code:** M
ACGIH STEL: N/P **ACGIH STEL Code:**
EPA Reporting Quantity:
DOT Reporting Quantity:
Ozone Depleting Chemical:

Ingredient Name: ING 2: ARRIVED. INGESTION: CALL MD IMMEDIATELY (FP N).
Ingredient CAS Number: Ingredient CAS Code: X
RTECS Number: 9999999ZZ **RTECS Code:** M
=WT: =WT Code:
=Volume: =Volume Code:
>WT: >WT Code:
>Volume: >Volume Code:
<WT: <WT Code:
<Volume: <Volume Code:
% Low WT: % Low WT Code:
% High WT: % High WT Code:
% Low Volume: % Low Volume Code:
% High Volume: % High Volume Code:
% Text: N/K
% Enviromental Weight:
Other REC Limits: N/K

OSHA PEL: N/K (FP N) **OSHA PEL Code:** M
OSHA STEL: OSHA STEL Code:
ACGIH TLV: N/K (FP N) **ACGIH TLV Code:** M
ACGIH STEL: N/P **ACGIH STEL Code:**
EPA Reporting Quantity:
DOT Reporting Quantity:
Ozone Depleting Chemical:

Ingredient Name: SUPP DATA: RESPS. IF PATIENT IS IN CARD ARREST ADMIN CPR. CONTINUE LIFE SUPPORTING MEASURES UNTIL MED ASSIST HAS (ING 3)
Ingredient CAS Number: Ingredient CAS Code: X
RTECS Number: 9999999ZZ **RTECS Code:** M
=WT: =WT Code:
=Volume: =Volume Code:
>WT: >WT Code:
>Volume: >Volume Code:
<WT: <WT Code:
<Volume: <Volume Code:
% Low WT: % Low WT Code:
% High WT: % High WT Code:
% Low Volume: % Low Volume Code:
% High Volume: % High Volume Code:
% Text: N/K
% Enviromental Weight:
Other REC Limits: N/K
OSHA PEL: N/K (FP N) **OSHA PEL Code:** M
OSHA STEL: OSHA STEL Code:
ACGIH TLV: N/K (FP N) **ACGIH TLV Code:** M
ACGIH STEL: N/P **ACGIH STEL Code:**
EPA Reporting Quantity:
DOT Reporting Quantity:
Ozone Depleting Chemical:

Section 3 - Hazards Identification, Including Emergency Overview
TETRACHLOROETHENE, 0-663

Health Hazards Acute & Chronic: CONT LENSES SHOULD NOT BE WORN IN LAB. ALL CHEMS SHOULD BE CONSIDERED HAZ-AVOID DIRECT PHYS CONT! CAN BE HARMFUL IF ABSORB THRU SKIN. CAN BE HARMFUL IF INHALED. CAN BE FATAL IF ABSORB THRU SKIN! CAN B E FATAL IF INHALED! MAY BE FATAL IF SWALLOWED! SUSPECTED CARCIN-MAY PRDCE CANCER. LACHRYMATOR-CAUSES (EFTS OF OVEREXP)

Signs & Symptoms of Overexposure:
HLTH HAZ: SEV EYE IRRIT. VAPS &/OR DIRECT EYE CONT CAN CAUSE SEV EYE BURNS. CAN CAUSE EYE IRRIT. VAPS &/OR DIRECT EYE CONT CAN CAUSE SEV EYE BURNS. CAN CAUSE EYE IRRIT. CAN CAUSE SKIN IRRIT. CAN CAUSE SKIN BURNS. CAN CAUSE SEV SKIN BURNS. CAN BE HARMFUL IF SWALLOWED. CAN CAUSE LIVER INJ. CAN CAUSE KIDNEY INJ. (SUPDAT)

Medical Conditions Aggravated by Exposure:

NONE SPECIFIED BY MANUFACTURER.

LD50 LC50 Mixture: LD50 (ORAL,RAT): 8850 MG/KG.

Route of Entry Indicators:
Inhalation: YES
Skin: YES
Ingestion: YES

Carcenogenicity Indicators
NTP: YES
IARC: YES
OSHA: NO

Carcinogenicity Explanation: TETRACHLOROETHYLENE: IARC MONOGRAPHS SUPP, VOL 7, PG 355, 1987: GRP 2B. NTP 7TH ANNUAL REPORT ON CARCINS, 1994: (SUPDAT)

Section 4 - First Aid Measures
TETRACHLOROETHENE, 0-663

First Aid:
AN ANTIDOTE IS SUBSTANCE INTENDED TO COUNTERACT EFT OF POIS. IT SHOULD BE ADMIN ONLY BY PHYS/TRAINED EMER PERS. MED ADVICE CAN BE OBTAINED FROM POIS CNTRL CNTR. EYE: FLUSH CONTINUOUSLY W/WATER FOR AT LST 15-20 MINS. SKIN: FLUSH W/WATER FOR15-20 MINS. IF NO BURNS HAVE OCCURRED-USE SOAP & WATER TO CLEANSE SKIN. INHAL: REMOVE PATIENT TO FRESH AIR. ADMIN OXYGEN IF PATIENT IS HAVING DFCLTY (SUPDAT)

Section 5 - Fire Fighting Measures
TETRACHLOROETHENE, 0-663

Fire Fighting Procedures:
WEAR NIOSH/MSHA APPROVED SCBA AND FULL PROTECTIVE EQUIPMENT (FP N).
Unusual Fire or Explosion Hazard:
NONE SPECIFIED BY MANUFACTURER.
Extinguishing Media:
CARBON DIOXIDE, DRY CHEMICAL POWDER OR SPRAY.
Flash Point: Flash Point Text: NON-FLAMMABLE

Autoignition Temperature:
Autoignition Temperature Text: N/A
Lower Limit(s): N/A
Upper Limit(s): N/A

Section 6 - Accidental Release Measures
TETRACHLOROETHENE, 0-663

Spill Release Procedures:
EVACUATE AREA. WEAR APPROPRIATE OSHA REGULATED EQUIPMENT. VENTILATE AREA. ABSORB ON VERMICULITE OR SIMILAR MATERIAL. SWEEP UP AND PLACE IN AN

APPROPRIATE CONTAINER. HOLD FOR DISPOSAL. WASH CONTAMINATE D SURFACES TO REMOVE ANY RESIDUES.

Section 7 - Handling and Storage
TETRACHLOROETHENE, 0-663

Handling and Storage Precautions:

Other Precautions:

Section 8 - Exposure Controls & Personal Protection
TETRACHLOROETHENE, 0-663

Repiratory Protection:
WEAR NIOSH/MSHA APPROVED RESPIRATOR APPROPRIATE FOR EXPOSURE OF CONCERN (FP N).
Ventilation:
CHEMICAL SHOULD BE HANDLED ONLY IN HOOD.
Protective Gloves:
IMPERVIOUS GLOVES (FP N).
Eye Protection: ANSI APPRVD CHEM WORKERS GOGG & (ING 4)
Other Protective Equipment: USE APPROPRIATE OSHA/MSHA APPROVED SAFETY EQUIPMENT.EMER EYEWASH & DELUGE SHOWER WHICH MEET ANSI DESIGN CRITERIA (FP N).
Work Hygenic Practices: NONE SPECIFIED BY MANUFACTURER.
Supplemental Health & Safety Information: EXPLAN OF CARCIN: ANTIC TO BE CARCIN. ANIMAL: LIVER TUMORS. EFTS OF OVEREXP: CAN BE IRRIT TO MUC MEMB. PRLNGD EXPOS MAY CAUSE NAUS/HDCH, DIZZ &/OR EYE DMG. AVOID CONSUMPTION OF ALCOHOL BEFORE & AFTER HNDLG OF CMPD BECAUSE IT WILL INCR TOX OF CMPD. FIRST AID PROC: BRTHG. IF PATIENT HAS STOPPED BRTHG ADMIN ARTF (ING 2)

Section 9 - Physical & Chemical Properties
TETRACHLOROETHENE, 0-663

HCC:
NRC/State License Number:
Net Property Weight for Ammo:
Boiling Point: Boiling Point Text: 250F,121C
Melting/Freezing Point: Melting/Freezing Text: 71.6F,22C
Decomposition Point: Decomposition Text: N/K
Vapor Pressure: 14 @ 20C **Vapor Density:** N/A
Percent Volatile Organic Content:
Specific Gravity: 1.623
Volatile Organic Content Pounds per Gallon:
pH: N/K
Volatile Organic Content Grams per Liter:
Viscosity: N/P
Evaporation Weight and Reference: NOT APPLICABLE
Solubility in Water: INSOLUBLE
Appearance and Odor: COLORLESS LIQUID.
Percent Volatiles by Volume: N/K

Corrosion Rate: N/K

Section 10 - Stability & Reactivity Data
TETRACHLOROETHENE, 0-663

Stability Indicator: YES
Materials to Avoid:
STRONG BASES, OXIDIZING AGENTS.
Stability Condition to Avoid:
NONE SPECIFIED BY MANUFACTURER.
Hazardous Decomposition Products:
DECOMPOSITION LIBERATES TOXIC FUMES. DECOMPOSITION PRODUCTS ARE CORROSIVE.
Hazardous Polymerization Indicator: NO
Conditions to Avoid Polymerization:
NOT RELEVANT.

Section 11 - Toxicological Information
TETRACHLOROETHENE, 0-663

Toxicological Information:
N/P

Section 12 - Ecological Information
TETRACHLOROETHENE, 0-663

Ecological Information:
N/P

Section 13 - Disposal Considerations
TETRACHLOROETHENE, 0-663

Waste Disposal Methods:
BURN IN CHEMICAL INCINERATOR EQUIPPED WITH AN AFTERBURNER AND SCRUBBER. DISPOSE OF IN ACCORDANCE WITH FEDERAL, STATE AND LOCAL REGULATIONS (FP N).

Section 14 - MSDS Transport Information
TETRACHLOROETHENE, 0-663

Transport Information:
N/P

Section 15 - Regulatory Information
TETRACHLOROETHENE, 0-663

SARA Title III Information:
N/P
Federal Regulatory Information:
N/P
State Regulatory Information:
N/P

Section 16 - Other Information
TETRACHLOROETHENE, 0-663

Other Information:
N/P

HAZCOM Label Information

Product Identification: TETRACHLOROETHENE, 0-663
CAGE: 84898
Assigned Individual: N
Company Name: CHEM SERVICE INC
Company PO Box: 3108
Company Street Address1: N/K
Company Street Address2: WEST CHESTER, PA 19381 US
Health Emergency Telephone: 215-692-3026
Label Required Indicator: Y
Date Label Reviewed: 11/03/1994
Status Code: C
Manufacturer's Label Number:
Date of Label: 11/03/1994
Year Procured: N/K
Organization Code: G
Chronic Hazard Indicator: Y
Eye Protection Indicator: YES
Skin Protection Indicator: YES
Respiratory Protection Indicator: YES
Signal Word: WARNING
Health Hazard: Moderate
Contact Hazard: Moderate
Fire Hazard: None
Reactivity Hazard: None

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MSDS Number: **T4914** * * * * * *Effective Date:* ***05/26/09*** * * * * * *Supercedes:* ***07/06/06***

MSDS Material Safety Data Sheet

From: Mallinckrodt Baker, Inc.
222 Red School Lane
Phillipsburg, NJ 08865

J.T.Baker ®

24 Hour Emergency Telephone: 908-859-2151
CHEMTREC: 1-800-424-9300

National Response in Canada
CANUTEC: 613-996-6666

Outside U.S. And Canada
Chemtrec: 703-527-3887

NOTE: CHEMTREC, CANUTEC and National Response Center emergency numbers to be used only in the event of chemical emergencies involving a spill, leak, fire, exposure or accident involving chemicals.

All non-emergency questions should be directed to Customer Service (1-800-582-2537) for assistance.

1,1,1-TRICHLOROETHANE

1. Product Identification

Synonyms: Methyl chloroform; trichloroethane; chloroetene
CAS No.: 71-55-6
Molecular Weight: 133.40
Chemical Formula: CH3CCl3
Product Codes: 9435, 9437, W509, W510

2. Composition/Information on Ingredients

Ingredient	CAS No	Percent	Hazardous
Methyl Chloroform	71-55-6	96 - 100%	Yes
Dioxane	123-91-1	< 3%	Yes
1,2-Epoxybutane	106-88-7	< 0.5%	Yes
Actual concentrations proprietary			

3. Hazards Identification

Emergency Overview

WARNING! HARMFUL IF SWALLOWED, INHALED OR ABSORBED THROUGH SKIN. AFFECTS CENTRAL NERVOUS SYSTEM, LIVER, KIDNEYS, AND CARDIOVASCULAR SYSTEM. CAUSES IRRITATION TO SKIN, EYES AND RESPIRATORY TRACT. POSSIBLE CANCER HAZARD. CONTAINS DIOXANE WHICH MAY CAUSE CANCER BASED ON ANIMAL DATA. Risk of cancer depends on duration and level of exposure.

SAF-T-DATA(tm) Ratings (Provided here for your convenience)

Health Rating: 3 - Severe (Cancer Causing)
Flammability Rating: 1 - Slight
Reactivity Rating: 1 - Slight
Contact Rating: 3 - Severe (Life)
Lab Protective Equip: GOGGLES; LAB COAT; VENT HOOD; PROPER GLOVES
Storage Color Code: Blue (Health)

Potential Health Effects

Inhalation:
Inhalation of vapors will irritate the respiratory tract. Affects the central nervous system. Symptoms include headache, dizziness, weakness, nausea. Higher levels of exposure (> 5000 ppm) can cause irregular heart beat, kidney and liver damage, fall in blood pressure, unconsciousness and even death.
Ingestion:
Harmful if swallowed. Symptoms similar to inhalation will occur along with nausea, vomiting. Aspiration of material into the lungs can cause chemical pneumonitis which can be fatal. If aspirated, may be rapidly absorbed through the lungs and result in injury to other body systems.
Skin Contact:
Causes mild irritation and redness, especially on prolonged contact. Repeated contact may cause drying or flaking of the skin.
Eye Contact:
Liquids and vapors cause irritation. Symptoms include tearing, redness, stinging, swelling.
Chronic Exposure:
Prolonged or repeated skin contact may cause dermatitis. Chronic exposure may affect the kidneys and liver. Dioxane is a suspected human carcinogen based on animal data.
Aggravation of Pre-existing Conditions:
Personnel with CNS, kidney, liver or heart disease may be more susceptible to the effects of this substance. Use of alcoholic beverages may aggravate symptoms.

---

4. First Aid Measures

Inhalation:
Remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Call a physician.

Ingestion:
If swallowed, DO NOT INDUCE VOMITING. Give large quantities of water. Never give anything by mouth to an unconscious person. Get medical attention immediately.
Skin Contact:
In case of contact, immediately flush skin with plenty of soap and water for at least 15 minutes while removing contaminated clothing and shoes. Wash clothing before reuse. Call a physician.
Eye Contact:
Immediately flush eyes with plenty of water for at least 15 minutes, lifting lower and upper eyelids occasionally. Get medical attention immediately.

---

5. Fire Fighting Measures

Fire:
Autoignition temperature: 500C (932F)
Flammable limits in air % by volume:
lel: 7.0; uel: 16.0
Vapors in containers can explode if subjected to high energy source.
Dioxane has a flash point below 16C (60F).
Explosion:
Can react with strong caustic, such as potash to form a flammable or explosive material. Air/vapor mixtures may explode when heated. Vapors can flow along surfaces to distant ignition source and flash back. Sealed containers may rupture when heated.
Fire Extinguishing Media:
Use any means suitable for extinguishing surrounding fire.
Special Information:
In the event of a fire, wear full protective clothing and NIOSH-approved self-contained breathing apparatus with full facepiece operated in the pressure demand or other positive pressure mode. Combustion by-products include phosgene and hydrogen chloride gases. Structural firefighters' clothing provides only limited protection to the combustion products of this material.

---

6. Accidental Release Measures

Ventilate area of leak or spill. Remove all sources of ignition. Wear appropriate personal protective equipment as specified in Section 8. Isolate hazard area. Keep unnecessary and unprotected personnel from entering. Contain and recover liquid when possible. Use non-sparking tools and equipment. Collect liquid in an appropriate container or absorb with an inert material (e. g., vermiculite, dry sand, earth), and place in a chemical waste container. Do not use combustible materials, such as saw dust. Do not flush to sewer! Do not use aluminum, magnesium or zinc metal for storage container. US Regulations (CERCLA) require reporting spills and releases to soil, water and air in excess of reportable quantities. The toll free number for the US Coast Guard National Response Center is (800) 424-8802.

---

7. Handling and Storage

Keep in a tightly closed container, stored in a cool, dry, ventilated area. Protect against physical damage. Isolate from any source of heat or ignition. Containers of this material may be hazardous when empty since they retain product residues (vapors, liquid); observe all warnings and precautions listed for the product. Do not use aluminum equipment or storage containers. Contact with aluminum parts in a pressurized fluid system may cause violent reactions.

---

8. Exposure Controls/Personal Protection

Airborne Exposure Limits:
-OSHA Permissible Exposure Limit (PEL):
350 ppm (TWA) for trichloroethane
100 ppm (TWA) skin for dioxane
-ACGIH Threshold Limit Value (TLV):
350 ppm (TWA), 450 ppm (STEL) for trichloroethane
20 ppm (TWA) skin, A3 - Animal Carcinogen for dioxane
Ventilation System:
A system of local and/or general exhaust is recommended to keep employee exposures below the Airborne Exposure Limits. Local exhaust ventilation is generally preferred because it can control the emissions of the contaminant at its source, preventing dispersion of it into the general work area. Please refer to the ACGIH document, *Industrial Ventilation, A Manual of Recommended Practices*, most recent edition, for details.
Personal Respirators (NIOSH Approved):
If the exposure limit is exceeded and engineering controls are not feasible, wear a supplied air, full-facepiece respirator, airlined hood, or full-facepiece self-contained breathing apparatus. Breathing air quality must meet the requirements of the OSHA respiratory protection standard (29CFR1910.134). This substance has questionable warning properties. Where respirators are required, you must have a written program covering the basic requirements in the OSHA respirator standard. These include training, fit testing, medical approval, cleaning, maintenance, cartridge change schedules, etc. See 29CFR1910.134 for details.
Skin Protection:
Wear impervious protective clothing, including boots, gloves, lab coat, apron or coveralls, as appropriate, to prevent skin contact. Viton is a recommended material for personal protective equipment.
Eye Protection:
Use chemical safety goggles and/or a full face shield where splashing is possible. Maintain eye wash fountain and quick-drench facilities in work area.

---

9. Physical and Chemical Properties

Appearance:
Clear, colorless liquid.

Odor:
Mild chloroform-like odor.
Solubility:
4,400 ppm in water @ 20C (68F)
Specific Gravity:
1.34 @ 20C/4C
pH:
No information found.
% Volatiles by volume @ 21C (70F):
100
Boiling Point:
74C (165F)
Melting Point:
-32C (-26F)
Vapor Density (Air=1):
4.63
Vapor Pressure (mm Hg):
100 @ 20C (68F)
Evaporation Rate (BuAc=1):
12.8

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10. Stability and Reactivity

Stability:
Requires inhibitor content to prevent corrosion of metals. Slowly hydrolyzes in water to form hydrochloric and acetic acid.
Hazardous Decomposition Products:
May produce carbon monoxide, carbon dioxide, hydrogen chloride and phosgene when heated to decomposition. Carbon dioxide and carbon monoxide may form when heated to decomposition.
Hazardous Polymerization:
Hazardous polymerization can occur in contact with aluminum trichloride.
Incompatibilities:
Open flames, welding arcs, nitrogen tetroxide, oxygen, liquid oxygen, sodium, sodium hydroxide, and sodium-potassium alloy, strong alkalis, oxidizers, aluminum and other reactive metals.
Conditions to Avoid:
Insufficient inhibitor, incompatibles, heat, flame and ignition sources

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11. Toxicological Information

Oral rat LD50: 9600 mg/kg; inhalation rat LC50: 18000 ppm/4H; investigated as a mutagen, tumorigen, reproductive effector; irritation eye rabbit, Standard Draize, 2mg/24H severe.

--------\Cancer Lists\----------

Ingredient	---NTP Carcinogen--- Known	Anticipated	IARC Category
Methyl Chloroform (71-55-6)	No	No	3
Dioxane (123-91-1)	No	Yes	2B
1,2-Epoxybutane (106-88-7)	No	No	2B

12. Ecological Information

Environmental Fate:
When released into the soil, this material is not expected to biodegrade. When released into the soil, this material is expected to leach into groundwater. When released into the soil, this material is expected to quickly evaporate. When released to water, this material is expected to quickly evaporate. This material is not expected to significantly bioaccumulate. When released into the air, this material may be removed from the atmosphere to a moderate extent by wet deposition. When released to the atmosphere, this material has an average global half-life of 6.0 - 6.9 years. When released into the air, this material may adversely affect the ozone layer.
Environmental Toxicity:
This material is expected to be slightly toxic to aquatic life. The LC50/96-hour values for fish are between 10 and 100 mg/l.

13. Disposal Considerations

Whatever cannot be saved for recovery or recycling should be handled as hazardous waste and sent to a RCRA approved incinerator or disposed in a RCRA approved waste facility. Processing, use or contamination of this product may change the waste management options. State and local disposal regulations may differ from federal disposal regulations. Dispose of container and unused contents in accordance with federal, state and local requirements.

14. Transport Information

Domestic (Land, D.O.T.)

Proper Shipping Name: 1,1,1-TRICHLOROETHANE
Hazard Class: 6.1
UN/NA: UN2831
Packing Group: III
Information reported for product/size: 20L

15. Regulatory Information

--------\Chemical Inventory Status - Part 1\--------

Ingredient	TSCA	EC	Japan	Australia
Methyl Chloroform (71-55-6)	Yes	Yes	Yes	Yes
Dioxane (123-91-1)	Yes	Yes	Yes	Yes
1,2-Epoxybutane (106-88-7)	Yes	Yes	Yes	Yes

--------\Chemical Inventory Status - Part 2\--------

Ingredient	Korea	--Canada-- DSL	NDSL	Phil.
Methyl Chloroform (71-55-6)	Yes	Yes	No	Yes
Dioxane (123-91-1)	Yes	Yes	No	Yes
1,2-Epoxybutane (106-88-7)	Yes	Yes	No	Yes

--------\Federal, State & International Regulations - Part 1\--------

Ingredient	-SARA 302- RQ	TPQ	------SARA 313------ List	Chemical Catg.
Methyl Chloroform (71-55-6)	No	No	Yes	No
Dioxane (123-91-1)	No	No	Yes	No
1,2-Epoxybutane (106-88-7)	No	No	Yes	No

--------\Federal, State & International Regulations - Part 2\--------

Ingredient	CERCLA	-RCRA- 261.33	-TSCA- 8(d)
Methyl Chloroform (71-55-6)	1000	U226	No
Dioxane (123-91-1)	100	U108	No
1,2-Epoxybutane (106-88-7)	100	No	No

Chemical Weapons Convention: No TSCA 12(b): No CDTA: No
SARA 311/312: Acute: Yes Chronic: Yes Fire: No Pressure: No
Reactivity: No (Mixture / Liquid)

WARNING:
THIS PRODUCT CONTAINS A CHEMICAL(S) KNOWN TO THE STATE OF CALIFORNIA TO CAUSE CANCER.

Australian Hazchem Code: 2[Z]
Poison Schedule: S6
WHMIS:
This MSDS has been prepared according to the hazard criteria of the Controlled Products Regulations (CPR) and the MSDS contains all of the information required by the CPR.

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16. Other Information

NFPA Ratings: Health: **2** Flammability: **1** Reactivity: **0**
Label Hazard Warning:
WARNING! HARMFUL IF SWALLOWED, INHALED OR ABSORBED THROUGH

SKIN. AFFECTS CENTRAL NERVOUS SYSTEM, LIVER, KIDNEYS, AND CARDIOVASCULAR SYSTEM. CAUSES IRRITATION TO SKIN, EYES AND RESPIRATORY TRACT. POSSIBLE CANCER HAZARD. CONTAINS DIOXANE WHICH MAY CAUSE CANCER BASED ON ANIMAL DATA. Risk of cancer depends on duration and level of exposure.

Label Precautions:

Avoid breathing vapor.
Keep container closed.
Use only with adequate ventilation.
Wash thoroughly after handling.
Avoid contact with eyes, skin and clothing.

Label First Aid:

If swallowed, DO NOT INDUCE VOMITING. Give large quantities of water. Never give anything by mouth to an unconscious person. If inhaled, remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. In case of contact, immediately flush eyes or skin with plenty of water for at least 15 minutes while removing contaminated clothing and shoes. Wash clothing before reuse. In all cases call a physician.

Product Use:

Laboratory Reagent.

Revision Information:

MSDS Section(s) changed since last revision of document include: 3.

Disclaimer:

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Mallinckrodt Baker, Inc. provides the information contained herein in good faith but makes no representation as to its comprehensiveness or accuracy. This document is intended only as a guide to the appropriate precautionary handling of the material by a properly trained person using this product. Individuals receiving the information must exercise their independent judgment in determining its appropriateness for a particular purpose. MALLINCKRODT BAKER, INC. MAKES NO REPRESENTATIONS OR WARRANTIES, EITHER EXPRESS OR IMPLIED, INCLUDING WITHOUT LIMITATION ANY WARRANTIES OF MERCHANTABILITY, FITNESS FOR A PARTICULAR PURPOSE WITH RESPECT TO THE INFORMATION SET FORTH HEREIN OR THE PRODUCT TO WHICH THE INFORMATION REFERS. ACCORDINGLY, MALLINCKRODT BAKER, INC. WILL NOT BE RESPONSIBLE FOR DAMAGES RESULTING FROM USE OF OR RELIANCE UPON THIS INFORMATION.

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Prepared by: Environmental Health & Safety
Phone Number: (314) 654-1600 (U.S.A.)

MATERIAL SAFETY DATA SHEET

(POLYCHLORINATED BIPHENYLS)

COMPOSITION/INFORMATION ON INGREDIENTS

Ingredients Name: polychlorinated biphenyls (PCBs)

HAZARD IDENTIFICATION

Reports of Carcinogenicity: YES

HEALTH HAZARDS ACUTE AND CHRONIC

- **Eyes**: Moderately irritating to eye tissues.
- **Skin**: Can be absorbed through intact skin, may cause de-fatting, potential for chloracne.
- **Inhalation**: Possible liver injury.
- **Ingestion**: Slightly toxic; reasonably anticipated to be carcinogenic.

EFFECTS OF OVER-EXPOSURE

Can cause dermatological symptoms; however, these are reversible upon removal of exposure source.

FIRST AID MEASURES

- **Eyes**: Irrigate immediately with copious quantities of running water for at least 15 minutes if liquid or solid PCBs get into them.
- **Skin:** Contaminated clothing should be removed and the skin washed thoroughly with soap and water. Hot PCBs may cause thermal burns.
- **Inhalation**: Remove to fresh air; if skin rash or respiratory irritation persists, consult a physician (if electrical equipment arcs over, PCBs may decompose to produce hydrochloric acid).
- **Ingestion**: Consult a physician. Do not induce vomiting or give any oily laxatives. (If large amounts are ingested, gastric lavage is suggested).

FIRE FIGHTING MEASURES: Flash Point: >141 ^{o}C (285.8 ^{o}F)

EXTINGUISHING MEDIA: PCBs are fire-resistant compounds.

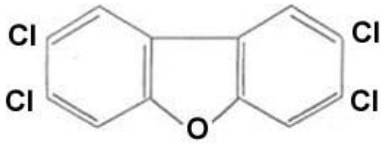
FIRE-FIGHTING PROCEDURES

Standard fire-fighting wearing apparel and self-contained breathing apparatus should be worn when fighting fires that involve possible exposure to chemical combustion products. Fire fighting equipment should be thoroughly cleaned and decontaminated after use.

UNUSUAL FIRE/EXPLOSION HAZARD

If a PCB transformer is involved in a fire-related incident, the owner of the transformer is required to report the incident. Consult and follow appropriate federal, provincial and local regulations.

***Note**: When askarel liquid becomes involved in a fire, toxic by-products of combustion are typically produced including polychlorinated dibenzofurans and polychlorinated dibenzodioxins, both known carcinogens. The structures of these chemical species are as follows:*

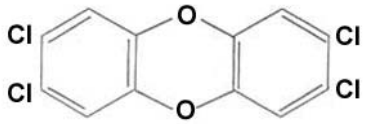


TCDF

$C_{12}H_{8-n}Cl_nO$

$n = 4 - 8$

2,3,7,8-tetrachlorodibenzofuran



TCDD

$C_{12}H_{8-n}Cl_nO_2$

$n = 4 - 8$

2,3,7,8-tetrachloro-dibenzo-p-dioxin

***Note**: 2,3,7,8-tetrachloro-dibenzo-p-dioxin is one of the most potent teratogenic, mutagenic and carcinogenic agents known to man.*

SPILL RELEASE PROCEDURES

Cleanup & disposal of liquid PCBs are strictly regulated by the federal government. Ventilate area. Contain spill/leak. Remove spill by means of absorptive material. Spill clean-up personnel should use proper protective clothing. All wastes and residues containing PCBs should be collected, containerized, marked and disposed of in the manner prescribed by applicable federal, provincial and local laws.

HANDLING AND STORAGE PRECAUTIONS

Care should be taken to prevent entry into the environment through spills, leakage, use, vaporization, or disposal of liquid. Avoid prolonged breathing of vapours or mists. Avoid contact with eyes or prolonged contact with skin. Comply with all federal, provincial and local regulations.

OTHER PRECAUTIONS

Federal regulations require PCBs, PCB items, storage areas, transformer vaults, and transport vehicles to be appropriately labelled.

RESPIRATORY PROTECTION

Use OHSA approved equipment when airborne exposure limits are exceeded. Full facepiece equipment is recommended and, if used, replaces need for face shield and/or chemical splash goggles. The respirator use limitations specified by the manufacturer must be observed.

VENTILATION

Provide natural or mechanical ventilation to control exposure levels below airborne exposure levels.

PROTECTIVE GLOVES: Wear appropriate chemical resistant gloves to prevent skin contact.

EYE PROTECTION: Wear chemical splash goggles and have eye baths available.

OTHER PROTECTIVE EQUIPMENT

Wear appropriate protective clothing. Provide a safety shower at any location where skin contact can occur.

WORK HYGIENIC PRACTICES

Wash thoroughly after handling. Supplemental safety and health : none

PHYSICAL/CHEMICAL PROPERTIES

- **Vapour pressure:** (mm Hg @100 ^{o}F) 0.005 - 0.00006
- **Viscosity:** (CENTISTOKES) 3.6 - 540
- **Stability indicator/materials to avoid:** Yes
- **Stability Condition to Avoid:** PCBs are very stable, fire-resistant compounds.

HAZARDOUS DECOMPOSITION PRODUCTS

Carbon monoxide, carbon dioxide, hydrogen chloride, phenolics, aldehydes, furans, dioxins

WASTE DISPOSAL METHODS

Consult the applicable PCB regulations prior to any disposal of PCBs or PCB-contaminated items.

MSDS Number: **C0071** * * * * * *Effective Date:* ***11/21/08*** * * * * * *Supercedes:* ***02/16/06***

MSDS Material Safety Data Sheet

From: Mallinckrodt Baker, Inc.
222 Red School Lane
Phillipsburg, NJ 08865

J.T.Baker ®

24 Hour Emergency Telephone: 908-859-2151
CHEMTREC: 1-800-424-9300

National Response in Canada
CANUTEC: 613-996-6666

Outside U.S. And Canada
Chemtrec: 703-527-3887

NOTE: CHEMTREC, CANUTEC and National Response Center emergency numbers to be used only in the event of chemical emergencies involving a spill, leak, fire, exposure or accident involving chemicals.

All non-emergency questions should be directed to Customer Service (1-800-582-2537) for assistance.

CADMIUM, 1,000 ug/mL or 10,000 ug/mL

1. Product Identification

Synonyms: Single Element Plasma Standards; Atomic Absorption Standards
CAS No.: Not applicable to mixtures.
Molecular Weight: Not applicable to mixtures.
Chemical Formula: Not applicable to mixtures.
Product Codes: 5709, 5723, 6447

2. Composition/Information on Ingredients

Ingredient	CAS No	Percent	Hazardous
Cadmium	7440-43-9	0.1 - 1%	Yes
Nitric Acid	7697-37-2	< 4%	Yes
Water	7732-18-5	> 95%	No

3. Hazards Identification

Emergency Overview

DANGER! CORROSIVE. LIQUID AND MIST CAUSE SEVERE BURNS TO ALL BODY TISSUE. MAY BE FATAL IF SWALLOWED OR INHALED. VAPOR IRRITATING TO EYES AND RESPIRATORY TRACT. INHALATION MAY CAUSE LUNG AND TOOTH DAMAGE. MAY AFFECT RESPIRATORY SYSTEM, KIDNEYS, PROSTATE, AND BLOOD. CANCER HAZARD. CAN CAUSE CANCER. Risk of cancer depends on duration and level of exposure.

SAF-T-DATA(tm) Ratings (Provided here for your convenience)

Health Rating: 3 - Severe (Cancer Causing)
Flammability Rating: 0 - None
Reactivity Rating: 1 - Slight
Contact Rating: 3 - Severe (Corrosive)
Lab Protective Equip: GOGGLES & SHIELD; LAB COAT & APRON; VENT HOOD; PROPER GLOVES
Storage Color Code: White (Corrosive)

Potential Health Effects

Nitric acid is extremely hazardous; it is corrosive, reactive, an oxidizer, and a poison. The following hazards are for concentrated solutions. Hazards of less concentrated solutions may be reduced. Degree of hazard for reduced concentrations is not currently addressed in the available literature.

Inhalation:
Corrosive! Inhalation of vapors can cause coughing, choking, inflammation of the nose, throat, and upper respiratory tract, and in severe cases, pulmonary edema, circulatory failure, and death.
Ingestion:
Corrosive! Swallowing can cause immediate pain and burns of the mouth, throat, esophagus and gastrointestinal tract. May cause nausea, vomiting, and diarrhea, and in severe cases, death.
Skin Contact:
Corrosive! Can cause redness, pain, and severe skin burns. Concentrated solutions cause deep ulcers and stain skin a yellow or yellow-brown color.
Eye Contact:
Corrosive! Vapors are irritating and may cause damage to the eyes. Contact may cause severe burns and permanent eye damage.
Chronic Exposure:
Long-term exposure to concentrated vapors may cause erosion of teeth and lung damage. Long-term exposures seldom occur due to the corrosive properties of the acid. Chronic exposure to cadmium, even at relatively low concentrations, may result in permanent damage to the kidney and lung, may damage the liver, may cause anemia, loss of smell, and increase risk of cancer of the lung and of the prostate.
Aggravation of Pre-existing Conditions:
Persons with pre-existing skin disorders, or eye or cardiopulmonary diseases may be more susceptible to the effects of this substance.

4. First Aid Measures

Immediate first aid treatment reduces the health effects of this substance.
Inhalation:
Remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Get medical attention immediately.
Ingestion:
If swallowed, DO NOT INDUCE VOMITING. Give large quantities of water. Never give anything by mouth to an unconscious person. Get medical attention immediately.
Skin Contact:
Immediately flush skin with plenty of water for at least 15 minutes while removing contaminated clothing and shoes. Get medical attention immediately. Wash clothing before reuse. Thoroughly clean shoes before reuse.
Eye Contact:
Immediately flush eyes with plenty of water for at least 15 minutes, lifting lower and upper eyelids occasionally. Get medical attention immediately.

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5. Fire Fighting Measures

Fire:
Not combustible, but concentrated material is a strong oxidizer and its heat of reaction with reducing agents or combustibles may cause ignition.
Explosion:
Concentrated material reacts explosively with combustible organic or readily oxidizable materials such as: alcohols, turpentine, charcoal, organic refuse, metal powder, hydrogen sulfide, etc. Reacts with most metals to release hydrogen gas which can form explosive mixtures with air.
Fire Extinguishing Media:
Use any means suitable for extinguishing surrounding fire.
Special Information:
In the event of a fire, wear full protective clothing and NIOSH-approved self-contained breathing apparatus with full facepiece operated in the pressure demand or other positive pressure mode.

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6. Accidental Release Measures

Ventilate area of leak or spill. Wear appropriate personal protective equipment as specified in Section 8. Isolate hazard area. Keep unnecessary and unprotected personnel from entering. Contain and recover liquid when possible. Neutralize with alkaline material (soda ash, lime), then absorb with an inert material (e. g., vermiculite, dry sand, earth), and place in a chemical waste container. Do not use combustible materials, such as saw dust. Do not flush to sewer! US Regulations (CERCLA) require reporting spills and releases to soil, water and air in excess of reportable quantities. The toll free number for the US Coast Guard National Response Center is (800) 424-8802.

J. T. Baker NEUTRASORB® acid neutralizers are recommended for spills of this product.

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7. Handling and Storage

Store in a cool, dry, ventilated storage area with acid resistant floors and good drainage. Protect from physical damage. Keep out of direct sunlight and away from heat, water, and incompatible materials. Do not wash out container and use it for other purposes. When diluting, the acid should always be added slowly to water and in small amounts. Never use hot water and never add water to the acid. Water added to acid can cause uncontrolled boiling and splashing. When opening metal containers, use non-sparking tools because of the possibility of hydrogen gas being present. Wear special protective equipment (Sec. 8) for maintenance break-in or where exposures may exceed established exposure levels. Wash hands, face, forearms and neck when exiting restricted areas. Shower, dispose of outer clothing, change to clean garments at the end of the day. Avoid cross-contamination of street clothes. Wash hands before eating and do not eat, drink, or smoke in workplace. Containers of this material may be hazardous when empty since they retain product residues (vapors, liquid); observe all warnings and precautions listed for the product.

---

8. Exposure Controls/Personal Protection

Airborne Exposure Limits:
- OSHA Permissible Exposure Limit (PEL) -
For nitric acid:
2 ppm (TWA).
For cadmium, elemental and compounds:
0.005 mg/m3 (TWA); 0.0025 mg/m3 (Action Level); OSHA Cancer Hazard.

- ACGIH Threshold Limit Value (TLV) -
For nitric acid:
2 ppm (TWA); 4 ppm (STEL).
For cadmium, elemental and compounds (inhalable particulate):
0.01 mg/m3 (TWA), A2 - Suspected human carcinogen.
For cadmium, elemental and compounds (respirable fraction):
0.002 mg/m3 (TWA), A2 - Suspected human carcinogen.

Ventilation System:
A system of local and/or general exhaust is recommended to keep employee exposures below the Airborne Exposure Limits. Local exhaust ventilation is generally preferred because it can control the emissions of the contaminant at its source, preventing dispersion of it into the general work area. Please refer to the ACGIH document, *Industrial Ventilation, A Manual of Recommended Practices*, most recent edition, for details.
Personal Respirators (NIOSH Approved):
If the exposure limit is exceeded and engineering controls are not feasible, wear a supplied air, full-facepiece respirator, airlined hood, or full-facepiece self-contained breathing apparatus. Breathing air quality must meet the requirements of the OSHA respiratory

protection standard (29CFR1910.134). Canister-type respirators using sorbents are ineffective. Where respirators are required, you must have a written program covering the basic requirements in the OSHA respirator standard. These include training, fit testing, medical approval, cleaning, maintenance, cartridge change schedules, etc. See 29CFR1910.134 for details.

Skin Protection:
Rubber or neoprene gloves and additional protection including impervious boots, apron, or coveralls, as needed in areas of unusual exposure to prevent skin contact.

Eye Protection:
Use chemical safety goggles and/or a full face shield where splashing is possible. Maintain eye wash fountain and quick-drench facilities in work area.

Other Control Measures:
Eating, drinking, and smoking should not be permitted in areas where solids or liquids containing cadmium compounds are handled, processed, or stored. See OSHA substance-specific standard for more information on personal protective equipment, engineering and work practice controls, medical surveillance, record keeping, and reporting requirements. (29 CFR 1910.1027).

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9. Physical and Chemical Properties

Appearance:
Clear, colorless liquid.

Odor:
Odorless.

Solubility:
Soluble in water.

Specific Gravity:
No information found.

pH:
No information found.

% Volatiles by volume @ 21C (70F):
99

Boiling Point:
No information found.

Melting Point:
No information found.

Vapor Density (Air=1):
Not applicable.

Vapor Pressure (mm Hg):
Not applicable.

Evaporation Rate (BuAc=1):
No information found.

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10. Stability and Reactivity

Stability:

Stable under ordinary conditions of use and storage.
Hazardous Decomposition Products:
When heated to decomposition, emits toxic nitrogen oxides fumes and hydrogen nitrate.
Hazardous Polymerization:
Will not occur.
Incompatibilities:
A dangerously powerful oxidizing agent, concentrated nitric acid is incompatible with most substances, especially strong bases, metallic powders, carbides, hydrogen sulfide, turpentine, and combustible organics.
Conditions to Avoid:
Heat, flames, ignition sources and incompatibles.

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11. Toxicological Information

Toxicological Data:
Nitric acid: Investigated as a mutagen and reproductive effector. Cadmium: Oral rat LD50 2330 mg/kg; Inhalation rat LC50 25 mg/m3/30M; Investigated as a tumorigen, mutagen and reproductive effector.

Reproductive Toxicity:
For cadmium: May damage the reproductive system.

Carcinogenicity:
For cadmium:
EPA / IRIS classification: Group B1 - Probable human carcinogen, limited human evidence.

Regulated by OSHA as a carcinogen.

--------\Cancer Lists\----------

Ingredient	---NTP Carcinogen--- Known	Anticipated	IARC Category
Cadmium (7440-43-9)	Yes	No	1
Nitric Acid (7697-37-2)	No	No	None
Water (7732-18-5)	No	No	None

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12. Ecological Information

Environmental Fate:
No information found.
Environmental Toxicity:
No information found.

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13. Disposal Considerations

Whatever cannot be saved for recovery or recycling should be managed in an appropriate and approved waste disposal facility. Processing, use or contamination of this product may change the waste management options. State and local disposal regulations may differ from federal disposal regulations. Dispose of container and unused contents in accordance with federal, state and local requirements.

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14. Transport Information

Domestic (Land, D.O.T.)

Proper Shipping Name: CORROSIVE LIQUID, ACIDIC, INORGANIC, N.O.S. (NITRIC ACID)
Hazard Class: 8
UN/NA: UN3264
Packing Group: III
Information reported for product/size: 150ML

International (Water, I.M.O.)

Proper Shipping Name: CORROSIVE LIQUID, ACIDIC, INORGANIC, N.O.S. (NITRIC ACID)
Hazard Class: 8
UN/NA: UN3264
Packing Group: III
Information reported for product/size: 150ML

International (Air, I.C.A.O.)

Proper Shipping Name: CORROSIVE LIQUID, ACIDIC, INORGANIC, N.O.S. (NITRIC ACID)
Hazard Class: 8
UN/NA: UN3264
Packing Group: III
Information reported for product/size: 150ML

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15. Regulatory Information

--------\Chemical Inventory Status - Part 1\---------------------------------

Ingredient	TSCA	EC	Japan	Australia
Cadmium (7440-43-9)	Yes	Yes	No	Yes
Nitric Acid (7697-37-2)	Yes	Yes	Yes	Yes
Water (7732-18-5)	Yes	Yes	Yes	Yes

--------\Chemical Inventory Status - Part 2\--------------------------------

Ingredient	Korea	--Canada-- DSL	NDSL	Phil.
Cadmium (7440-43-9)	Yes	Yes	No	Yes
Nitric Acid (7697-37-2)	Yes	Yes	No	Yes
Water (7732-18-5)	Yes	Yes	No	Yes

--------\Federal, State & International Regulations - Part 1\----------------

Ingredient	-SARA 302- RQ	TPQ	------SARA 313------ List	Chemical Catg.
Cadmium (7440-43-9)	No	No	Yes	No
Nitric Acid (7697-37-2)	1000	1000	Yes	No
Water (7732-18-5)	No	No	No	No

--------\Federal, State & International Regulations - Part 2\----------------

Ingredient	CERCLA	-RCRA- 261.33	-TSCA- 8(d)
Cadmium (7440-43-9)	10	No	No
Nitric Acid (7697-37-2)	1000	No	No
Water (7732-18-5)	No	No	No

Chemical Weapons Convention: No TSCA 12(b): No CDTA: No
SARA 311/312: Acute: Yes Chronic: Yes Fire: No Pressure: No
Reactivity: No (Mixture / Liquid)

WARNING:
THIS PRODUCT CONTAINS CHEMICALS KNOWN TO THE STATE OF CALIFORNIA TO CAUSE CANCER AND BIRTH DEFECTS OR OTHER REPRODUCTIVE HARM.

Australian Hazchem Code: None allocated.
Poison Schedule: S6
WHMIS:
This MSDS has been prepared according to the hazard criteria of the Controlled Products Regulations (CPR) and the MSDS contains all of the information required by the CPR.

---

16. Other Information

NFPA Ratings: Health: **3** Flammability: **0** Reactivity: **0**
Label Hazard Warning:
DANGER! CORROSIVE. LIQUID AND MIST CAUSE SEVERE BURNS TO ALL BODY TISSUE. MAY BE FATAL IF SWALLOWED OR INHALED. VAPOR IRRITATING TO EYES AND RESPIRATORY TRACT. INHALATION MAY CAUSE LUNG AND TOOTH DAMAGE. MAY AFFECT RESPIRATORY SYSTEM, KIDNEYS, PROSTATE, AND BLOOD. CANCER HAZARD. CAN CAUSE CANCER. Risk of cancer depends on duration and level of exposure.
Label Precautions:
Do not get in eyes, on skin, or on clothing.

Do not breathe vapor or mist.
Use only with adequate ventilation.
Wash thoroughly after handling.
Keep container closed.

Label First Aid:

In case of contact, immediately flush eyes or skin with plenty of water for at least 15 minutes while removing contaminated clothing and shoes. Wash clothing before reuse. If inhaled, remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. If swallowed, DO NOT INDUCE VOMITING. Give large quantities of water. Never give anything by mouth to an unconscious person. In all cases get medical attention immediately.

Product Use:

Laboratory Reagent.

Revision Information:

MSDS Section(s) changed since last revision of document include: 3.

Disclaimer:

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Mallinckrodt Baker, Inc. provides the information contained herein in good faith but makes no representation as to its comprehensiveness or accuracy. This document is intended only as a guide to the appropriate precautionary handling of the material by a properly trained person using this product. Individuals receiving the information must exercise their independent judgment in determining its appropriateness for a particular purpose. MALLINCKRODT BAKER, INC. MAKES NO REPRESENTATIONS OR WARRANTIES, EITHER EXPRESS OR IMPLIED, INCLUDING WITHOUT LIMITATION ANY WARRANTIES OF MERCHANTABILITY, FITNESS FOR A PARTICULAR PURPOSE WITH RESPECT TO THE INFORMATION SET FORTH HEREIN OR THE PRODUCT TO WHICH THE INFORMATION REFERS. ACCORDINGLY, MALLINCKRODT BAKER, INC. WILL NOT BE RESPONSIBLE FOR DAMAGES RESULTING FROM USE OF OR RELIANCE UPON THIS INFORMATION.

****

Prepared by: Environmental Health & Safety
Phone Number: (314) 654-1600 (U.S.A.)

MSDS Number: **C4304** * * * * * *Effective Date:* ***11/21/08*** * * * * * *Supercedes:* ***02/16/06***

MSDS Material Safety Data Sheet

From: Mallinckrodt Baker, Inc.
222 Red School Lane
Phillipsburg, NJ 08865

J.T.Baker ®

24 Hour Emergency Telephone: 908-859-2151
CHEMTREC: 1-800-424-9300

National Response in Canada
CANUTEC: 613-996-6666

Outside U.S. And Canada
Chemtrec: 703-527-3887

NOTE: CHEMTREC, CANUTEC and National Response Center emergency numbers to be used only in the event of chemical emergencies involving a spill, leak, fire, exposure or accident involving chemicals.

All non-emergency questions should be directed to Customer Service (1-800-582-2537) for assistance.

Chromium, 1,000 ug/mL or 10,000 ug/mL

1. Product Identification

Synonyms: Single Element Plasma Standard; Atomic Absorption Standard
CAS No.: Not applicable to mixtures.
Molecular Weight: Not applicable to mixtures.
Chemical Formula: Not applicable to mixtures.
Product Codes: 5711, 5727, 6449

2. Composition/Information on Ingredients

Ingredient	CAS No	Percent	Hazardous
Chromium	7440-47-3	0.1 - 1%	Yes
Hydrogen Chloride	7647-01-0	< 2%	Yes
Water	7732-18-5	> 97%	No

3. Hazards Identification

Emergency Overview

DANGER! CORROSIVE. LIQUID AND MIST CAUSE SEVERE BURNS TO ALL BODY TISSUE. MAY BE FATAL IF SWALLOWED OR INHALED. VAPOR IRRITATING TO EYES AND RESPIRATORY TRACT. INHALATION MAY CAUSE LUNG DAMAGE.

SAF-T-DATA(tm) Ratings (Provided here for your convenience)

Health Rating: 3 - Severe (Life)
Flammability Rating: 0 - None
Reactivity Rating: 1 - Slight
Contact Rating: 3 - Severe (Corrosive)
Lab Protective Equip: GOGGLES & SHIELD; LAB COAT & APRON; VENT HOOD; PROPER GLOVES
Storage Color Code: White (Corrosive)

Potential Health Effects

Health hazards given on this data sheet apply to concentrated solutions of hydrochloric acid. Hazards of dilute solutions may be reduced, depending upon the concentration. Degree of hazard for these reduced concentrations is not currently addressed in the available literature.

Inhalation:
Corrosive! Inhalation of vapors can cause coughing, choking, inflammation of the nose, throat, and upper respiratory tract, and in severe cases, pulmonary edema, circulatory failure, and death.
Ingestion:
Corrosive! Swallowing hydrochloric acid can cause immediate pain and burns of the mouth, throat, esophagus and gastrointestinal tract. May cause nausea, vomiting, and diarrhea, and in severe cases, death.
Skin Contact:
Corrosive! Can cause redness, pain, and severe skin burns. Concentrated solutions cause deep ulcers and discolor skin.
Eye Contact:
Corrosive! Vapors are irritating and may cause damage to the eyes. Contact may cause severe burns and permanent eye damage.
Chronic Exposure:
Long-term exposure to concentrated vapors may cause erosion of teeth. Long term exposures seldom occur due to the corrosive properties of the acid. Chronic exposure to chromium may cause skin or lung allergy.
Aggravation of Pre-existing Conditions:
Persons with pre-existing skin disorders or eye disease may be more susceptible to the effects of this substance.

---

4. First Aid Measures

Inhalation:
Remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Get medical attention immediately.
Ingestion:
If swallowed, DO NOT INDUCE VOMITING. Give large quantities of water. Never give anything by mouth to an unconscious person. Get medical attention immediately.
Skin Contact:
Immediately flush skin with plenty of water for at least 15 minutes while removing contaminated clothing and shoes. Get medical attention immediately. Wash clothing before reuse. Thoroughly clean shoes before reuse.
Eye Contact:
Immediately flush eyes with plenty of water for at least 15 minutes, lifting lower and upper eyelids occasionally. Get medical attention immediately.

---

5. Fire Fighting Measures

Fire:
Not considered to be a fire hazard. Extreme heat or contact with metals can release flammable hydrogen gas.
Explosion:
Contact of concentrated solutions with most metals causes formation of flammable and explosive hydrogen gas.
Fire Extinguishing Media:
Water or water spray. Neutralize with soda ash or slaked lime.
Special Information:
In the event of a fire, wear full protective clothing and NIOSH-approved self-contained breathing apparatus with full facepiece operated in the pressure demand or other positive pressure mode. Structural firefighter's protective clothing is ineffective for fires involving hydrochloric acid. Stay away from ends of tanks. Cool tanks with water spray until well after fire is out.

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6. Accidental Release Measures

Ventilate area of leak or spill. Wear appropriate personal protective equipment as specified in Section 8. Isolate hazard area. Keep unnecessary and unprotected personnel from entering. Contain and recover liquid when possible. Neutralize with alkaline material (soda ash, lime), then absorb with an inert material (e. g., vermiculite, dry sand, earth), and place in a chemical waste container. Do not use combustible materials, such as saw dust. Do not flush to sewer! US Regulations (CERCLA) require reporting spills and releases to soil, water and air in excess of reportable quantities. The toll free number for the US Coast Guard National Response Center is (800) 424-8802.

J. T. Baker NEUTRASORB® acid neutralizers are recommended for spills of this product.

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7. Handling and Storage

Store in a cool, dry, ventilated storage area with acid resistant floors and good drainage. Protect from physical damage. Keep out of direct sunlight and away from heat, water, and incompatible materials. Do not wash out container and use it for other purposes. When diluting, the acid should always be added slowly to water and in small amounts. Containers of this material may be hazardous when empty since they retain product residues (vapors, liquid); observe all warnings and precautions listed for the product.

---

8. Exposure Controls/Personal Protection

Airborne Exposure Limits:
For Hydrochloric acid:
- OSHA Permissible Exposure Limit (PEL):
5 ppm (Ceiling)
- ACGIH Threshold Limit Value (TLV):
2 ppm (Ceiling), A4 Not classifiable as a human carcinogen
For Chromium (metal, inorganic Cr, and Cr III) compounds :
- OSHA Permissible Exposure Limit (PEL):
1 mg/m3 (TWA).
- ACGIH Threshold Limit Value (TLV):
0.5 mg/m3 (TWA), A4 - not classifiable as human carcinogen.

Ventilation System:
A system of local and/or general exhaust is recommended to keep employee exposures below the Airborne Exposure Limits. Local exhaust ventilation is generally preferred because it can control the emissions of the contaminant at its source, preventing dispersion of it into the general work area. Please refer to the ACGIH document, *Industrial Ventilation, A Manual of Recommended Practices*, most recent edition, for details.

Personal Respirators (NIOSH Approved):
If the exposure limit is exceeded, a full facepiece respirator with an acid gas cartridge may be worn up to 50 times the exposure limit or the maximum use concentration specified by the appropriate regulatory agency or respirator supplier, whichever is lowest. For emergencies or instances where the exposure levels are not known, use a full-facepiece positive-pressure, air-supplied respirator. WARNING: Air purifying respirators do not protect workers in oxygen-deficient atmospheres.

Skin Protection:
Rubber or neoprene gloves and additional protection including impervious boots, apron, or coveralls, as needed in areas of unusual exposure to prevent skin contact.

Eye Protection:
Use chemical safety goggles and/or a full face shield where splashing is possible. Maintain eye wash fountain and quick-drench facilities in work area.

---

9. Physical and Chemical Properties

Appearance:

Clear, colorless liquid.
Odor:
Hydrochloric acid odor.
Solubility:
Complete (100%)
Specific Gravity:
No information found.
pH:
No information found.
% Volatiles by volume @ 21C (70F):
99
Boiling Point:
No information found.
Melting Point:
No information found.
Vapor Density (Air=1):
Not applicable.
Vapor Pressure (mm Hg):
Not applicable.
Evaporation Rate (BuAc=1):
No information found.

---

10. Stability and Reactivity

Stability:
Stable under ordinary conditions of use and storage. Containers may burst when heated.
Hazardous Decomposition Products:
When heated to decomposition, emits toxic hydrogen chloride fumes and will react with water or steam to produce heat and toxic and corrosive fumes. Thermal oxidative decomposition produces toxic chlorine fumes and explosive hydrogen gas.
Hazardous Polymerization:
Will not occur.
Incompatibilities:
A strong mineral acid, concentrated hydrochloric acid is incompatible with many substances and highly reactive with strong bases, metals, metal oxides, hydroxides, amines, carbonates and other alkaline materials. Incompatible with materials such as cyanides, sulfides, sulfites, and formaldehyde.
Conditions to Avoid:
Heat, direct sunlight, incompatibles.

---

11. Toxicological Information

Hydrochloric acid: Inhalation rat LC50: 3124 ppm/1H; Oral rabbit LD50: 900 mg/kg. Investigated as a tumorigen, mutagen, reproductive effector. For Chromium: Investigated as a tumorigen and mutagen.

--------\Cancer Lists\----------

Ingredient	---NTP Carcinogen--- Known	Anticipated	IARC Category
Chromium (7440-47-3)	No	No	3
Hydrogen Chloride (7647-01-0)	No	No	3
Water (7732-18-5)	No	No	None

12. Ecological Information

Environmental Fate:
For Hydrochloric Acid (Concentrated Solutions):
When released into the soil, this material is not expected to biodegrade. When released into the soil, this material may leach into groundwater.
Environmental Toxicity:
For Hydrochloric Acid (Concentrated Solutions):
This material may be toxic to aquatic life. LC50 Shrimp: 100-300 ppm/48-hr/salt water; LC100 trout: 10 mg/l/24-hr; TLm mosquito fish: 282 ppm/96-hr.

13. Disposal Considerations

Whatever cannot be saved for recovery or recycling should be handled as hazardous waste and sent to a RCRA approved waste facility. Processing, use or contamination of this product may change the waste management options. State and local disposal regulations may differ from federal disposal regulations. Dispose of container and unused contents in accordance with federal, state and local requirements.

14. Transport Information

Domestic (Land, D.O.T.)

Proper Shipping Name: CORROSIVE LIQUID, ACIDIC, INORGANIC, N.O.S. (HYDROGEN CHLORIDE)
Hazard Class: 8
UN/NA: UN3264
Packing Group: III
Information reported for product/size: 150ML

International (Water, I.M.O.)

Proper Shipping Name: CORROSIVE LIQUID, ACIDIC, INORGANIC, N.O.S. (HYDROGEN CHLORIDE)
Hazard Class: 8
UN/NA: UN3264

Packing Group: III
Information reported for product/size: 150ML

International (Air, I.C.A.O.)

Proper Shipping Name: CORROSIVE LIQUID, ACIDIC, INORGANIC, N.O.S. (HYDROGEN CHLORIDE)
Hazard Class: 8
UN/NA: UN3264
Packing Group: III
Information reported for product/size: 150ML

---

15. Regulatory Information

--------\Chemical Inventory Status - Part 1\---------------------------------

Ingredient	TSCA	EC	Japan	Australia
Chromium (7440-47-3)	Yes	Yes	Yes	Yes
Hydrogen Chloride (7647-01-0)	Yes	Yes	Yes	Yes
Water (7732-18-5)	Yes	Yes	Yes	Yes

--------\Chemical Inventory Status - Part 2\---------------------------------

		--Canada--		
Ingredient	Korea	DSL	NDSL	Phil.
Chromium (7440-47-3)	Yes	Yes	No	Yes
Hydrogen Chloride (7647-01-0)	Yes	Yes	No	Yes
Water (7732-18-5)	Yes	Yes	No	Yes

--------\Federal, State & International Regulations - Part 1\----------------

	-SARA 302-		------SARA 313------	
Ingredient	RQ	TPQ	List	Chemical Catg.
Chromium (7440-47-3)	No	No	Yes	No
Hydrogen Chloride (7647-01-0)	5000	500*	Yes	No
Water (7732-18-5)	No	No	No	No

--------\Federal, State & International Regulations - Part 2\----------------

		-RCRA-	-TSCA-
Ingredient	CERCLA	261.33	8(d)
Chromium (7440-47-3)	5000	No	No
Hydrogen Chloride (7647-01-0)	5000	No	No
Water (7732-18-5)	No	No	No

Chemical Weapons Convention: No TSCA 12(b): No CDTA: No
SARA 311/312: Acute: Yes Chronic: Yes Fire: No Pressure: No
Reactivity: No (Mixture / Liquid)

Australian Hazchem Code: None allocated.

Poison Schedule: None allocated.
WHMIS:
This MSDS has been prepared according to the hazard criteria of the Controlled Products Regulations (CPR) and the MSDS contains all of the information required by the CPR.

---

16. Other Information

NFPA Ratings: Health: **3** Flammability: **0** Reactivity: **1**
Label Hazard Warning:
DANGER! CORROSIVE. LIQUID AND MIST CAUSE SEVERE BURNS TO ALL BODY TISSUE. MAY BE FATAL IF SWALLOWED OR INHALED. VAPOR IRRITATING TO EYES AND RESPIRATORY TRACT. INHALATION MAY CAUSE LUNG DAMAGE.
Label Precautions:
Do not get in eyes, on skin, or on clothing.
Do not breathe vapor or mist.
Use only with adequate ventilation.
Keep container closed.
Wash thoroughly after handling.
Label First Aid:
In case of contact, immediately flush eyes or skin with plenty of water for at least 15 minutes while removing contaminated clothing and shoes. Wash clothing before reuse. If inhaled, remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. If swallowed, DO NOT INDUCE VOMITING. Give large quantities of water. Never give anything by mouth to an unconscious person. In all cases get medical attention immediately.
Product Use:
Laboratory Reagent.
Revision Information:
MSDS Section(s) changed since last revision of document include: 3.
Disclaimer:
****

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Prepared by: Environmental Health & Safety
Phone Number: (314) 654-1600 (U.S.A.)

APPENDIX B
Maintenance and Monitoring Equipment and Tool List

Site 1 – Soil Vapor Extraction Containment System
NWIRP Bethpage, NY

Maintenance and Monitoring Equipment and Tool List

Equipment Name	Model	Part – Description	Part Number
Dayton Utility Pump	Dayton 1P580	12VDC Portable Utility Pump	Grainger # 1P580
Purge Pump	Whale WP4012 Mini Purger	Groundwater Purging Pump	
Pressure Gauge	Dwyer	0 – 1 inches of water	2001 Magnehelic
Pressure Gauge	Dwyer	0 – 10 inches of water	2010 Magnehelic
Tool Set	Craftsman	154 Piece Mechanics	935154

PROCESS EQUIPMENT

Tag Number	Description
M-1	Moisture Separator
F-1	Make-up Air Filter/Silencer
F-2	Blower Air Filter
B-1A	Blower B-1A
B-1B	Blower B-1B
VGAC-1	Vapor-phase Granular Activated Carbon Unit
P-1	Condensate Pump
FMS	Flow Monitoring Station – 8’ X 20’ steel container

Moisture Separator Tank
Tag No.: M-1
Name: Moisture Separator Tank
Type: Vertical, Cylindrical, Closed-top, Vented
Rating: 1,000 Gallons, 5 ft DIA 4 ft H sideshell
Manufacturer: Tetrasolv Filtration

Soil Vapor Extraction Blowers
Tag No: B-1A and B-1B
Name: Soil Vapor Extraction Blower
Rating: 600 CFM, 40 i.w.
Manufacturer: National Turbine Corporation
Model: Millennium Series Model M24-319R
Serial No.: 291055-A and 291055-B
Motor
Manufacturer: WEG Electric Corporation
Rating: 7.5 HP, 460V 60Hz 3Phase, Induction
Model: 00735OP3E184T

Vapor-phase Granular Activated Carbon Adsorber
Tag No.: VGAC-1
Name: Vapor Phase Granular Activated Carbon Adsorber
Type: Rectangular Carbon Adsorption Vessel
Rating: 1,000 CFM
Operating Conditions: 5 i.w. max pressure
Manufacturer: Tetrasolv Filtration
Model: VF-5000
Carbon Details: 4 x 10 US mesh virgin carbon

Process Piping
Schedule 40 PVC

Conduit
Galvanized Rigid Metal Conduit

SOIL VAPOR EXTRACTION WELLS

All SVE wells installed with above ground well casing.

Tag Number	Description
SVE-101I	Intermediate Extraction Well
SVE-101D	Deep Extraction Well
SVE-102I	Intermediate Extraction Well
SVE-102D	Deep Extraction Well
SVE-103I	Intermediate Extraction Well
SVE-103D	Deep Extraction Well
SVE-104I	Intermediate Extraction Well
SVE-104D	Deep Extraction Well
SVE-105I	Intermediate Extraction Well
SVE-105D	Deep Extraction Well
SVE-106I	Intermediate Extraction Well
SVE-106D	Deep Extraction Well

SOIL VAPOR PRESSURE MONITOR POINTS

All SVPM points installed with flush mount well man-hole, 6” diameter.

Tag Number	Description
SVPM-2002-S	Shallow Soil Vapor Pressure Monitor
SVPM-2003-S	Shallow Soil Vapor Pressure Monitor
SVPM-2002-I	Intermediate Soil Vapor Pressure Monitor
SVPM-2003-I	Intermediate Soil Vapor Pressure Monitor

Tag Number	Description
SVPM-2004-I	Intermediate Soil Vapor Pressure Monitor
SVPM-2007-I	Intermediate Soil Vapor Pressure Monitor
SVPM-2002-D	Deep Soil Vapor Pressure Monitor
SVPM-2004-D	Deep Soil Vapor Pressure Monitor
SVPM-2007-D	Deep Soil Vapor Pressure Monitor

CONDENSATE PORTS

Five (5) SCH 40 PVC condensate ports installed with flush mount well man-hole, 12" diameter.

VALVES

Tag Number	Description
BFV-101I	Flow Control Valve for SVE-101I
BFV-101D	Flow Control Valve for SVE-101D
BFV-102I	Flow Control Valve for SVE-102I
BFV-102D	Flow Control Valve for SVE-102D
BFV-103I	Flow Control Valve for SVE-103I
BFV-103D	Flow Control Valve for SVE-103D
BFV-104I	Flow Control Valve for SVE-104I
BFV-104D	Flow Control Valve for SVE-104D
BFV-105I	Flow Control Valve for SVE-105I
BFV-105D	Flow Control Valve for SVE-105D
BFV-106I	Flow Control Valve for SVE-106I
BFV-106D	Flow Control Valve for SVE-106D
BV-101I	Isolation Valve Vacuum Gauge for SVE-101I
BV-101D	Isolation Valve Vacuum Gauge for SVE-101D
BV-102I	Isolation Valve Vacuum Gauge for SVE-102I
BV-105D	Isolation Valve Vacuum Gauge for SVE-105D
BV-106I	Isolation Valve Vacuum Gauge for SVE-106I
BV-106D	Isolation Valve Vacuum Gauge for SVE-106D
BV-100	Isolation Valve Vacuum Gauge for manifold in Flow Monitoring Station
BV-101	Isolation Valve Air Bleed to manifold in Flow Monitoring Station

Tag Number	Description
BFV-101	Butterfly Valve Inlet to Moisture Separator
BFV-102	Butterfly Valve Inlet to Make-up Air Filter/Silencer
BFV-103A	Butterfly Valve B-1A Suction Line
BFV-103B	Butterfly Valve B-1B Suction Line
BFV-104A	Butterfly Valve B-1A Discharge Line
BFV-104B	Butterfly Valve B-1B Discharge Line
BV-102	Isolation Valve Low Pressure Switch
BV-103	Isolation Valve Vacuum Gauge Inlet to M-1
BV-104	Isolation Valve Air Bleed Inlet to M-1
BV-105	Isolation Valve Vacuum Gauge Suction Line to Blowers
BV-106	Isolation Valve Pressure Gauge Discharge Line from Blowers
BV-107	Isolation Valve High Pressure Switch
BV-108	Isolation Valve Air Bleed Inlet to VGAC-1
BV-109	Isolation Valve Air Bleed Outlet from VGAC-1
BV-110	Isolation Valve Pressure Gauge Discharge Line from VGAC-1
PRV-101	Pressure (Vacuum) Relief Valve Suction Line to Blowers
PRV-102	Pressure Relief Valve Discharge Line from Blowers

INSTRUMENTATION

Instrumentation and controls associated with the Soil Vapor Treatment Process Loop are summarized in the following table:

Control	Setpoint	Function
Vacuum Indicator PI-101I	0-10 i.w.	Indicates vacuum in line from SVE-101I
Vacuum Indicator PI-101D	0-30 i.w.	Indicates vacuum in line from SVE-101D
Vacuum Indicator PI-102I	0-10 i.w.	Indicates vacuum in line from SVE-102I
Vacuum Indicator PI-102D	0-30 i.w.	Indicates vacuum in line from SVE-102D
Vacuum Indicator PI-103I	0-10 i.w.	Indicates vacuum in line from SVE-103I
Vacuum Indicator PI-103D	0-30 i.w.	Indicates vacuum in line from SVE-103D
Vacuum Indicator PI-104I	0-10 i.w.	Indicates vacuum in line from SVE-104I
Vacuum Indicator PI-104D	0-30 i.w.	Indicates vacuum in line from SVE-104D
Vacuum Indicator PI-105I	0-10 i.w.	Indicates vacuum in line from SVE-105I
Vacuum Indicator PI-105D	0-30 i.w.	Indicates vacuum in line from SVE-105D
Vacuum Indicator PI-106I	0-10 i.w.	Indicates vacuum in line from SVE-106I
Vacuum Indicator PI-106D	0-30 i.w.	Indicates vacuum in line from SVE-106D

Control	Setpoint	Function
Vacuum Indicator PI-100	0-60 i.w.	Indicates vacuum in manifold in Flow Monitoring Station
Low Vacuum Switch PSL-101	45 i.w.	Indicates low vacuum in inlet to moisture separator tank, M-1
Vacuum Indicator PI-101	0-60 i.w.	Indicates vacuum in inlet to moisture separator tank, M-1
High Level Switch LSH-101		Indicates high condensate level in moisture separator tank, M-1
Differential Pressure Indicator DPI-101	0-10 i.w.	Indicates differential pressure across blower air filter, F-2
Vacuum Indicator PI-102	0-60 i.w.	Indicates vacuum in suction line to blowers B-1A and B-1B
Pressure Indicator PI-103	0-10 i.w.	Indicates pressure in discharge line from blowers B-1A and B-1B
Temperature Indicator TI-101	20-240 ^{o}F	Indicates temperature in discharge line from blowers B-1A and B-1B
High Temperature Switch TSH-101	140 ^{o}F	Indicates high temperature in discharge line from blowers B-1A and B-1B
High Pressure Switch PSH-101	10 i.w.	Indicates high pressure in discharge line from blowers B-1A and B-1B
Pressure Indicator PI-104	0-10 i.w.	Indicates pressure in discharge line from VGAC-1

ELECTRICAL AND MECHANICAL EQUIPMENT

Tag	Description
PP-1	480V Power Distribution Panel
CP	Control Panel with Autodialer
MS	Motor Starter
V-1	¼ HP Building Exhaust Fan
V-2	¼ HP Building Exhaust Fan
L-1	Louver, Fixed Frame with Blades & Bird Screen
L-2	Louver, Fixed Frame with Blades & Bird Screen
H-1A	5KW Heater
H-1B	5 KW Heater
SCP	Security Control Panel with Autodialer
FCP	Fire Alarm Control Panel
FA	Manual Fire Alarm Pull Station - 3
HD	Heat Detector – 4
SD	Smoke Detector – 2
H	Fire Alarm Horn with Flasher - 3
F	Ceiling Mounted Double Tube Fluorescent Light – 9
XLPI-18	Exit Lighting Fixture – 3

Tag	Description
LPI-18	Emergency Lights - 3
LPI-14	GFCI Duplex Receptacle - 2
LPI-16	GFCI Duplex Receptacle - 3
PP-7	480V 3 Pole Receptacle - 1

APPENDIX C
Spare Parts List

Site 1 – Soil Vapor Extraction Containment System
NWIRP Bethpage, NY

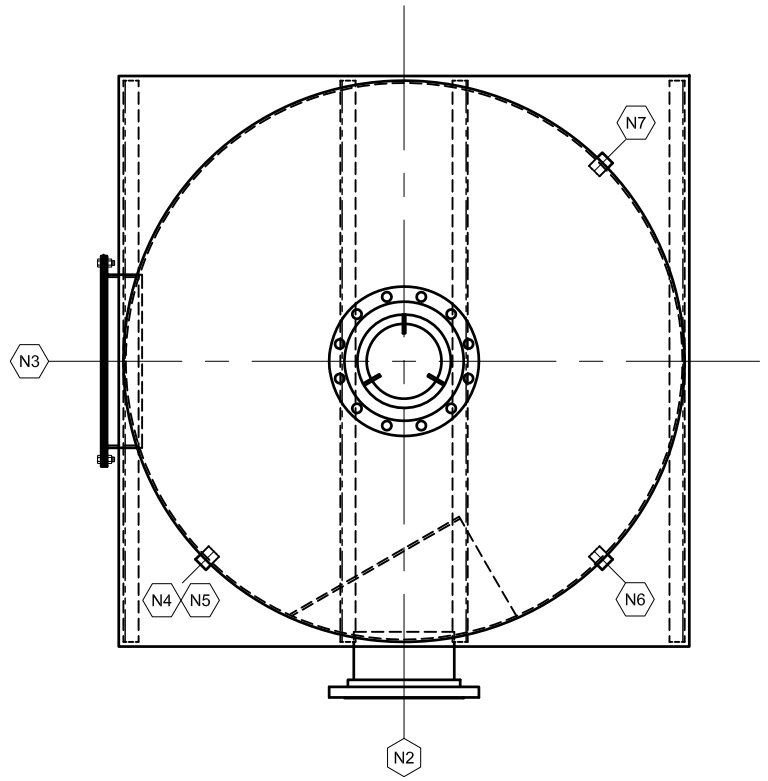
Spare Parts List

Equipment Name	Model	Part – Description	Part Number

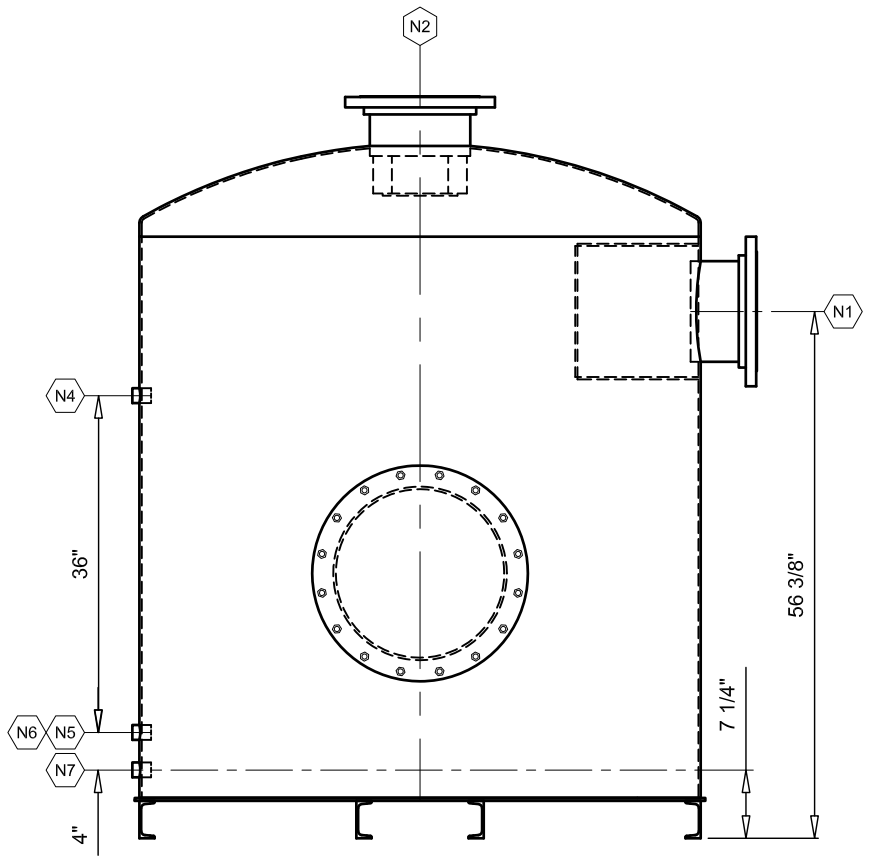
This list is intentionally left blank.

APPENDIX D
Manufacturer's O&M Manuals

D-1
Moisture Separator Tank M-1



PLAN VIEW
TRUE ORIENTATION



SIDE ELEVATION VIEW
NOT TRUE ORIENTATION

NOZZLE SCHEDULE OF OPENINGS

Mark	Size	Rating	Type	Qty	Nozzle Description / or Service
N1	10"	150#	ANSI	1	PROCESS INLET
N2	10"	150#	ANSI	1	PROCESS OUTLET
N3	18"	N/A	N/A	1	INTERNAL ACCESS
N4	1"	150#	FNPT	1	UPPER LEVEL SWITCH CONNECTION
N5	1"	150#	FNPT	1	LOWER LEVEL SWITCH CONNECTION
N6	1"	150#	FNPT	1	PUMP OUT
N7	1"	150#	FNPT	1	DRAIN

VESSEL DESIGN DATA

Vessel Registration	None	Year Built	2009
Vessel Construction	n/a	Vessel Serial Number	-
Internal Design Pressure	15 PSIG	Capacity (Volume)	96 FT3
Internal Design Temp	100 Deg F.	Shipping Weight (Empty)	(TBA) POUNDS
External Design Pressure	FULL VACUUM	Weight full of Water	(TBA) POUNDS
Operating Pressure	NOT APPLICABLE	Gasket Material	NEOPRENE
Operating Temperature	NOT APPLICABLE	Studs & Nuts	SA-193-B7 / SA-194-2H
MDMT	-	Internal Surface Prep	SSPC-SP10 Near White - 2 mil profile
MAWP (New & Cold)	TBD	External Surface Prep	SSPC-SP7 Brush Blast
MAWP (Hot & Corroded)	TBD	Internal Primer	Sherwin Williams 646 - 5 mils DFT
Test Pressure	10 PSIG PNEUMATIC	Internal Finish	Sherwin Williams 646 - 5 mils DFT
Corrosion Allowance	n/a	External Primer	Sherwin Williams
Radiography	NONE	External Intermediate	n/a
Post Weld Heat Treat	NONE	External Finish	Sherwin Willams 646
Material Impact Tests	n/a	Color	Safety Blue
Material Hardness	n/a	Insulation	NONE

tetraSOLV FILTRATION

REV	DESCRIPTION of CHANGE	DWN	CHK	APP	DATE
-	-	-	-	-	-

PROJECT: NWIRP
KNOCK OUT TANK
60" DIAMETER x 48" SIDESHELL

CUSTOMER / END USER: BISCO ENVIRONMENTAL

LOCATION: Bethpage, NY

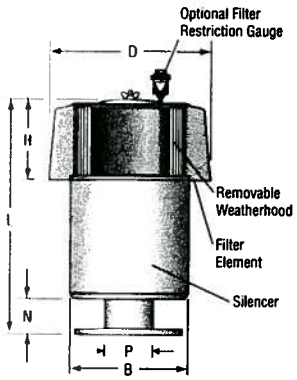
JOB #:	-	TAG #:	-	CUST PO:	-
DWN BY:	KB (IFD)	DATE:	AUG 27/09	Qty Req'd:	ONE
CHK BY:	TB (IFD)	DATE:	AUG 27/09	SCALE:	3/4" = 1'-0" @ (D SIZE)
APP BY:	EP (TF)	DATE:	AUG 27/09	DWG #: M-01	REV: 0

D-2
Air Filters F-1 and F-2

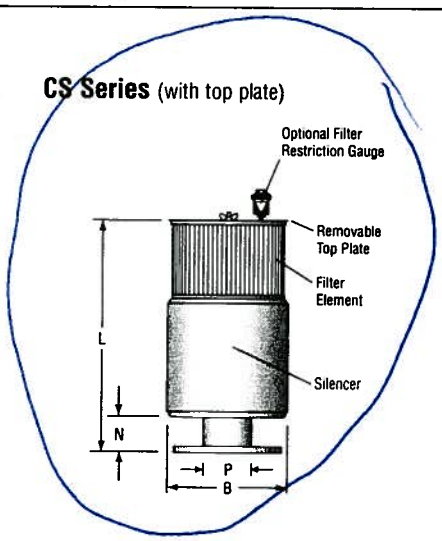
CCS/CS Series
Filter-Silencers

CCF/CF Series
Filters

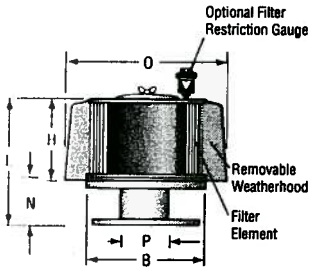
CCS Series (with weatherhood)



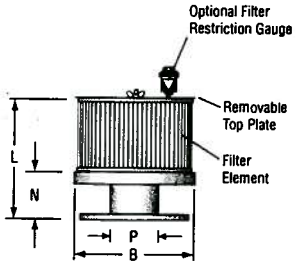
CS Series (with top plate)



CCF Series (with weatherhood)



CF Series (with top plate)



Part Numbers

Pipe Size	CCS	CS	CCF	CF
½	34-K50-TT*	34-M50-TT*		
¾	34-K70-TT*	34-M70-TT*	*Sizes ½"–1" Use CCS or CS Series*	
1	34-K01-TT*	34-M01-TT*		
1¼	34-K21-TT*	34-M21-TT*	34-L21-TT*	34-N21-TT*
1½	34-K15-TT*	34-M15-TT*	34-L15-TT*	34-N15-TT*
2	34-K02-TT*	34-M02-TT*	34-L02-TT*	34-N02-TT*
2½	34-K25-TT*	34-M25-TT*	34-L25-TT*	34-N25-TT*
3	34-K03-TT*	34-M03-TT*	34-L03-TT*	34-N03-TT*
3½	34-K35-TT*	34-M35-TT*	34-L35-TT*	34-N35-TT*
4	34-K04-TT*	34-M04-TT*	34-L04-TT*	34-N04-TT*
4	34-K04-AA*	34-M04-AA*	34-L04-AA*	34-N04-AA*
5	34-K05-TT*	34-M05-TT*	34-L05-TT*	34-N05-TT*
5	34-K05-AA*	34-M05-AA*	34-L05-AA*	34-N05-AA*
6	34-K06-AA*	34-M06-AA*	34-L06-AA*	34-N06-AA*
8	34-K08-AA*	34-M08-AA*	34-L08-AA*	34-N08-AA*
10	34-K10-AA*	34-M10-AA*	34-L10-AA*	34-N10-AA*
12	34-K12-AA*	34-M12-AA*	34-L12-AA*	34-N12-AA*
14	34-K14-AA*	34-M14-AA*	34-L14-AA*	34-N14-AA*
16	34-K16-AA*	34-M16-AA*	34-L16-AA*	34-N16-AA*

*Specify "P" at end of part number for unit with pleated paper elements, "F" for pleated felt or "W" for wire mesh.
Refer to page 8.11 for filter element details.

Universal Silencer's cartridge filters and filter-silencers offer high-performance filtration and silencing in a convenient, economical cartridge configuration. Choose from four standard models for pipe sizes ranging from ½" to 16" and for flow capacities ranging from 15 to 7,700 CFM. Three types of filter element media—pleated paper, pleated felt, or wire mesh—are available to suit your application.

The CCF and CF series filters are high-quality air filters without a silencing section. The CCF has a removable weatherhood, and the CF has a removable top plate. Our CCS and CS intake filter-silencers have a built-in silencing section. The CCS features a removable weatherhood, and the CS has a removable top plate for easy access to the filter element.

Performance Benefits

- **Durability**
  Weatherhoods for CCF and CCS sizes 2½" through 5" are rugged blue ABS composite material that may be painted. All other components are carbon steel construction with a high-quality semi-gloss enamel finish.
- **High Performance**
  Unique design options, combined with the latest manufacturing techniques, ensure optimum performance and long life even under demanding conditions.
- **Functional**
  Choice of filter only or filter-silencer.
- **Easy to Maintain**
  Removable lightweight weatherhood (CCS and CCF) or removable top plate (CS and CF) for easy access to the filter element.
- **Versatile**
  Interchangeable element options for desired filtration characteristics in the same housing.

See pages 1.1–1.3 for ordering information | www.universalsilencer.com

CCS/CS Series

Filter-Silencers

CCF/CF Series

Filters

Noise Attenuation, CCS/CS

Attenuation, dB	Octave Band Center Frequency, Hz
5	63
8	125
10	250
12	500
14	1,000
14	2,000
14	4,000
14	8,000

Pressure Drop, All Models

Pressure Drop (in. of H_2O)	Percentage of Rated Flow
0.7	50%
1.6	75%
2.8	100%
4.4	125%
6.3	150%

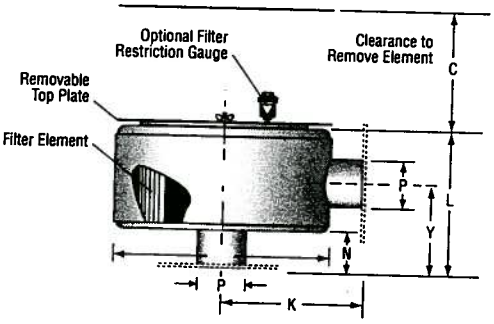
P (size)	Rated Flow Cap. (CFM)	D	H	B	N				L				Approx. Weight with Paper Elements			
					CCF	CCS	CF	CS	CCF	CCS	CF	CS	CCF	CCS	CF	CS
½	15	8.00	3.13	6.00	Use	—	Use	—	Use	6.50	Use	6.50	Use	7	Use	7
¾	22	8.00	3.13	6.00	CCS	—	CS	—	CCS	6.50	CS	6.50	CCS	7	CS	7
1	35	8.00	3.13	6.00	Series	—	Series	—	Series	6.50	Series	6.50	Series	7	Series	7
1¼	60	9.00	3.50	6.50	—	—	—	—	3.50	7.88	3.50	7.88	9	10	5	9
1½	75	9.00	3.50	6.50	—	—	—	—	3.50	7.88	3.50	7.88	9	10	5	9
2	120	9.00	3.50	6.50	—	—	—	—	3.50	7.88	3.50	7.88	8	10	5	8
2½	190	13.44	6.75	10.00	1.00	1.00	1.00	1.00	7.50	17.69	7.13	17.31	11	19	10	18
3	275	13.44	6.75	10.00	1.00	1.00	1.00	1.00	7.50	17.69	7.13	17.31	10	18	9	17
3½	375	13.44	6.75	10.00	1.13	1.13	1.13	1.13	7.63	17.69	7.25	17.31	13	20	12	19
4 (NPT)	500	13.44	6.75	10.00	1.13	1.13	1.13	1.13	7.63	17.69	7.25	17.31	12	19	11	18
4 (flanged)	500	13.44	6.75	10.00	4.00	3.00	4.00	3.00	10.50	19.63	10.13	19.25	14	21	13	20
5 (NPT)	750	13.44	6.75	10.00	1.81	1.81	1.81	1.81	8.38	18.25	8.00	17.88	12	19	11	18
5 (flanged)	750	13.44	6.75	10.00	4.00	3.00	4.00	3.00	10.50	19.56	10.13	19.13	16	23	15	22
6	1,100	18.00	9.50	14.00	4.00	3.00	4.00	3.00	13.31	25.25	12.75	24.75	31	43	23	35
8	2,200	20.00	18.00	14.00	4.00	3.00	4.00	3.00	21.88	33.88	21.38	33.38	43	56	30	43
10	3,000	24.00	11.50	18.00	4.00	3.00	4.00	3.00	15.38	29.25	14.19	28.13	52	83	41	67
12	4,300	24.00	11.50	18.00	4.00	3.00	4.00	3.00	15.38	29.25	14.19	28.13	64	91	48	75
14	5,900	30.00	15.44	24.00	4.00	3.00	4.00	3.00	19.38	36.25	18.25	35.06	97	143	75	121
16	7,700	30.00	15.44	24.00	4.00	3.00	4.00	3.00	19.38	36.25	18.25	35.06	101	145	79	123

All models have a ⅛" FNPT tap for installation of a gauge or manometer to monitor pressure drop. Sizes **½" through 3½"** are standard with female pipe thread connection (FNPT). Sizes **4" and 5"** are available with female threads or flanges. Please specify "threaded" or "flanged" when you order 4" and 5" sizes. Sizes **6" through 16"** are standard with 150# ANSI drilled plate flanges. Rated capacity is based upon exit velocity of approximately 5,500 ft/min. If pressure drop allowance permits, capacity may be increased by as much as 50%.

∴ See pages 1.1-1.3 for ordering information | www.universalsilencer.com

ILFV Series

Vacuum Service In-line Air Filters



Universal Silencer's new ILFV Series of in-line air filters are designed especially for vacuum applications as an economical alternative to our ILF Series. Choose from ten standard pipe sizes ranging from 2" to 14" and flow capacities ranging from 120 to 5,900 CFM. Two choices of filter element media—pleated paper or pleated felt—are available to suit your specific application.

Universal's Filter Restriction Gauge provides a convenient, accurate means of monitoring filter pressure drop as the filter element becomes increasingly loaded with dirt. In-line air filters are standard with threaded connections for directly mounting the gauge. See p. 9.15 for a complete description.

Filter Elements

Pleated paper elements offer the highest efficiency and are considered "standard" for the ILFV series units. Pleated felt elements are also available for less demanding service. Both element types are completely interchangeable and will fit in any ILFV housing.

Model	Part Number	P (nom.)	D	L	N	Y	C	K	Weight (est.)	Rated Cap. (CFM)
ILFV-2	34-D02-TT*	2	14	9.56	3.5	6.44	7	10	18	120
ILFV-2½	34-D25-TT*	2½	14	9.56	3.5	6.44	7	10	19	190
ILFV-3	34-D03-TT*	3	14	9.56	3.5	6.44	7	10	20	275
ILFV-4	34-D04-TT*	4	14	9.56	3.5	6.44	7	10	21	500
ILFV-5	34-D05-AA*	5	18	12.00	3.5	7.75	10	12	50	750
ILFV-6	34-D06-AA*	6	18	20.56	3.5	12.00	10	12	65	1,100
ILFV-8	34-D08-AA*	8	24	13.19	3.5	8.35	11	15	90	2,200
ILFV-10	34-D10-AA*	10	24	22.69	3.5	13.00	11	15	125	3,000
ILFV-12	34-D12-AA*	12	30	17.19	3.5	10.35	15	18	160	4,300
ILFV-14	34-D14-AA*	14	30	30.69	3.5	17.00	15	18	205	5,900

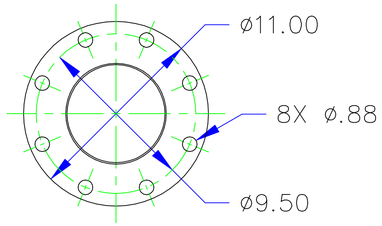
All models have a ⅛" FNPT tap for installation of a gauge or manometer to monitor pressure drop. The C dimension is clearance required to remove elements. Non-ASME code construction is suitable for 15" Hg vacuum. Not applicable for pressure applications. Rated capacity is based upon flow velocity of approximately 5500 ft/min. If pressure drop allowance permits, capacity may be increased by as much as 50%. Flange connections are drilled per ANSI standard for each size. Sizes 2" through 4" are standard with male pipe threaded inlet and outlet fitting (MNPT). Sizes 5" through 14" are standard with plate flanges drilled to ANSI standards (dashed lines on sketch). Weight does not include filter elements. **Refer to page 8.14 for filter element details.**

*Specify "P" at the end of part number for paper element or "F" for synthetic felt.

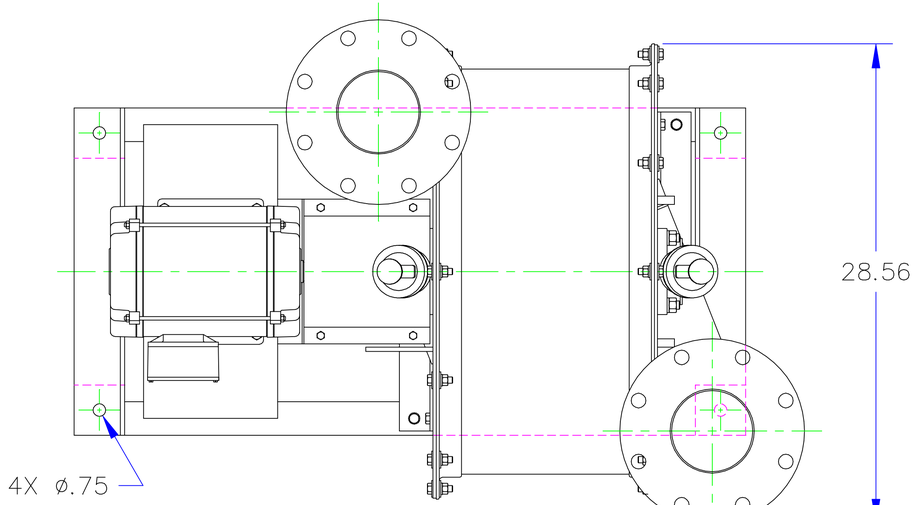
See pages 1.1–1.3 for ordering information | www.universalsilencer.com

D-3
Blowers B-1A and B-1B

REV.	CHANGE DESCRIPTION	ECN/NO.	NAME/DATE	CHK'D	REL. DATE
0	RELEASE		RAF 09/09/09		
1	INLET & OUTLET FLANGES WERE 8"		RTAF 09/11/09		

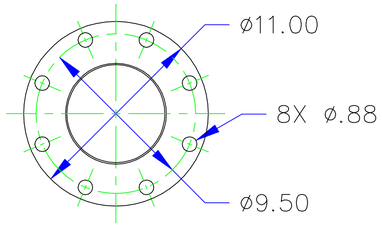


6" FLANGE
INLET

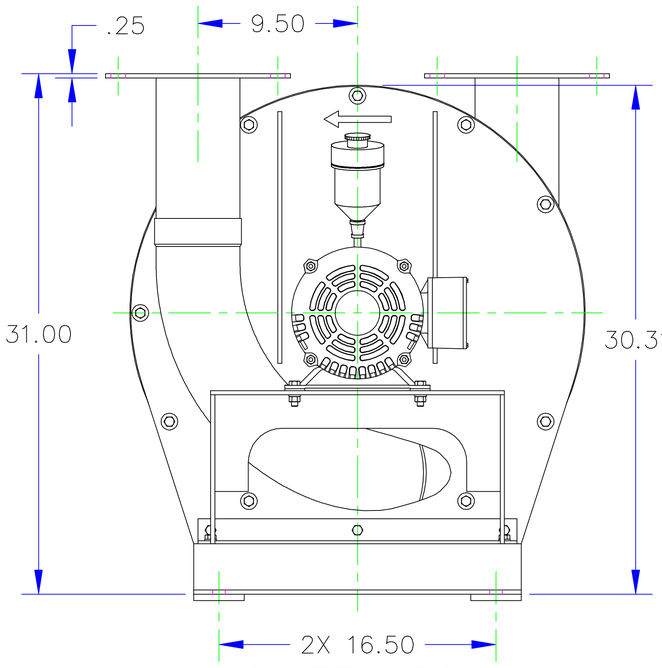


6" FLANGE
INLET

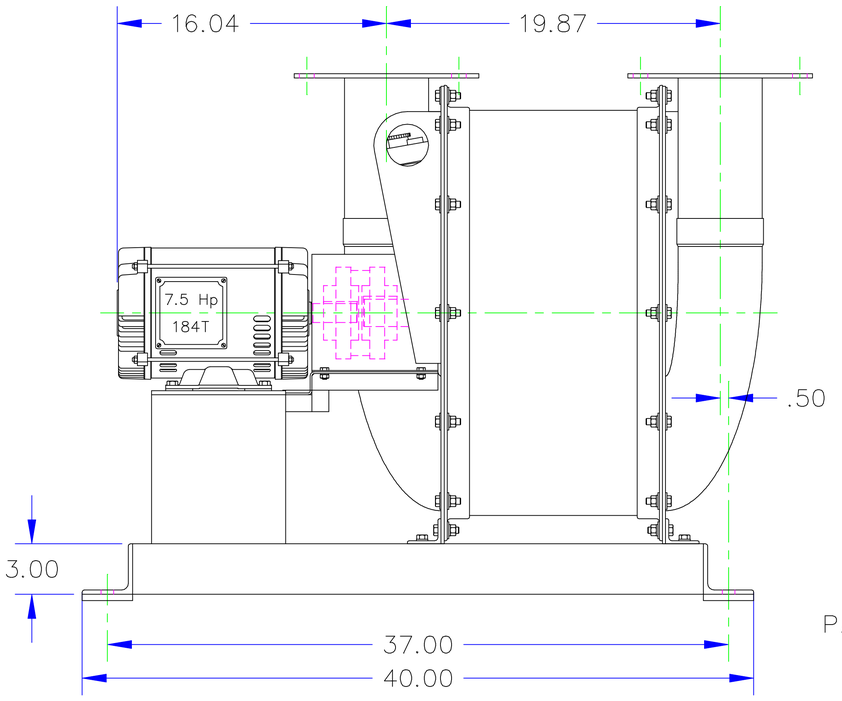
6" FLANGE
OUTLET

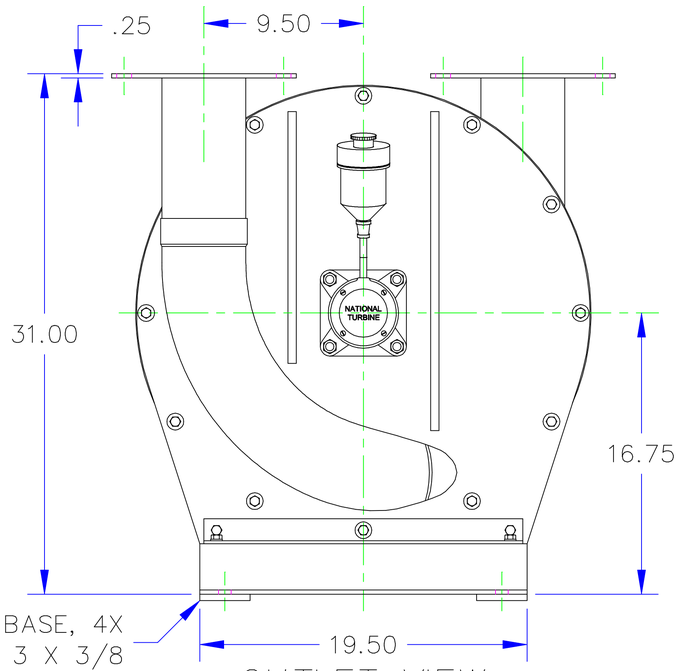


6" FLANGE
OUTLET



INLET VIEW





OUTLET VIEW

NOTES:
1 – CARBON STEEL HOUSING & SHAFT.
2 – 5" INLET/OUTLET TUBES WITH 6" FLANGES.
3 – GAS TIGHT WELDS.
4 – MODIFIED BASE P/N 291055-B93.

DO NOT SCALE DRAWING	SURFACE FINISH	SCALE: 1:1	DATE	APPROVED	DATE
TOLERANCES: UNLESS OTHERWISE NOTED		DRAWN: RAF	09/09/09	ENG: RAF	09/09/09
FRACTIONS: ± 1/16		CHECKED:		MFG:	
DECIMAL: XX ±.03 XXX ±.010	UNLESS OTHERWISE SPECIFIED	THIRD ANGLE PROJECTION			
ANGLES: ± 1°					
DIMENSIONS IN INCHES UNLESS OTHERWISE NOTED					

MILLENNIUM
M24
M24-319 W/7.5 HP MOTOR
BISCO ENVIRONMENTAL

NATIONAL TURBINE CORP.
SYRACUSE, NY

291055-A (DRAWING NO.) | SH. 1 OF 1 | 1 (REV.) | D (SIZE)

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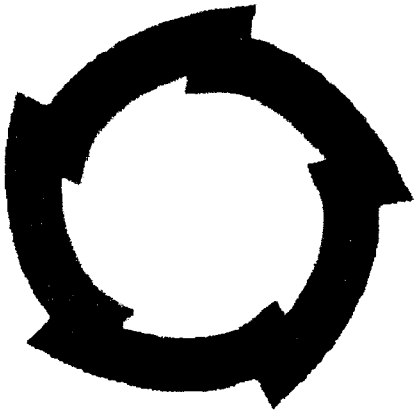


NATIONAL TURBINE CORPORATION

INSTALLATION AND OPERATING INSTRUCTIONS

MILLENNIUM SERIES

BLOWERS AND EXHAUSTERS

NATIONAL TURBINE CORPORATION
374 NORTHERN LIGHTS DRIVE
SYRACUSE, NY 13212

888-293-7434
FAX- 315-455-5545

RECEIVING & STORAGE

1. RECEIVING OF UNIT:

Upon receipt of your new **NATIONAL TURBINE** blower/exhauster a close visual inspection should be done to insure that no damage has occurred during transit. ANY DAMAGE OBSERVED MUST BE RECORDED IMMEDIATELY ON THE SHIPPING DOCUMENT AND A DAMAGE CLAIM FILED WITH THE RESPONSIBLE CARRIER.

2. HANDLING OF UNIT:

Your blower/exhauster is provided with 2 lifting eyes located on the inlet head. We recommend a 3-point lifting method by using the 2 lifting eyes on the unit and the one lifting eye on the motor. DO NOT LIFT BY SHAFT OR BEARING HOUSINGS. AVOID BENDING OR DISTORTING OF BASE.

3. STORAGE OF UNIT:

If your blower/exhauster is not going to be installed for a period of up to 90 days then you must store it in a clean, dry, well-ventilated area. The unit must be covered and keep out of the elements. Plastic or canvas is preferred. Rotation of the motor, unit shaft should be done at least once a week to redistribute bearing lubricant and prevent bearing damage. Keep a log of shaft rotation to ensure machine warranty protection.

If the storage of your blower/exhauster is longer than 90 days then in addition to the above storage information you will need to: suspend a bag of silica gel in the inlet and outlet heads to absorb excess moisture, coat exposed machine surfaces with a protective grease and follow motor manufactures instructions so that the motor is properly maintained.

INSTALLATION

The installation site should be clean and should have adequate space to allow personnel to service and repair the equipment if and when it is required.

The blower/exhauster should be located on a solid, level, and flat surface. The best surface is a concrete slab however; a well reinforced above grade surface is suitable.

Boltholes are provided for shipping and positioning purposes. If floor bolts are used the nuts should be only HAND TIGHTENED. EXCESSIVE TIGHTENING MAY DISTORT THE BASE AND CAUSE EXCESIVE VIBRATION. DO NOT WRENCH TIGHTEN BASE BOLTS. THIS COULD VOID THE EQUIPMENT WARRANTY.

Rubber vibration isolation pads have been supplied. These must be installed under the base as follows: one under each corner of the unit and one under each side of the base at approximately the middle of the unit.

PRE-STARTUP CHECKS

1. A visible inspection should be done to insure unit is on a solid foundation and vibration pads are installed.
2. Check motor connection to make sure it is wired properly. Refer to motor nameplate and control panel connections per electrical drawings. If additional items such as: temperature sensors, surge controls, vibrations switch's etc. have been provided then these must be correctly wired per manufacture's instructions.
3. Check for and remove any foreign material that might be located in the intake or discharge piping.
4. Remove coupling guard and recheck coupling aliment. The blower/exhauster and motor shafts were properly aligned at the factor prior to shipment. However, rough handling in transit could have disturbed this alignment. Therefore alignment must be rechecked and the unit realigned if necessary. Refer to coupling alignment sheet on page 5.
5. Lubrication. Your blower/exhauster has been pre-lubricated at the factory. The automatic lubrication system for the blower/exhauster bearings should be installed per the attached instruction sheets. Motor bearings should be lubricated per manufactures instructions.
6. After alignment has been checked the shaft should be rotated by hand several times to insure that the rotation is free and the unit rotor assembly does not rub.

7. Bump the motor to insure that the direction of rotation is correct. NOTE: CAUTION SHOULD BE OBSURVED TO KEEP HANDS, FEET AND ANY LOOSE CLOTHING AWAY FROM THIS ROTATING EQUIPMENT. THE COUPLING GUARD IS ONLY REMOVED TO CHECK ALIGNMENT AND ROTATION. NEVER OPERATE THIS EQUIPMENT WITHOUT THE COUPLING GRARD SECURELY BOLTED IN PLACE.
8. To start the blower/exhauster close the butterfly valve on the inlet of the unit and start the unit. It will take about 15 seconds for the unit to come up to full speed. By the use of a clamp on ammeter the amps with the unit running under no load should be recorded.
9. Slowly open butterfly valve to increase the airflow until the full load amps of the motor has been reached. Lock the butterfly valve at this point.
10. Allow the unit to run until it has reached full operating temperature. This should take about 15 minutes.
11. Now that the blower/exhauster is running check for unusual noises and vibration. NOTE: IF ANY DETECTION OF NOISE OR VIBRATION SHUT UNIT DOWN IMMEDIATELY.
12. Now that the blower/exhauster is running a check should be made on any on the operation of any optional item such as: surge protection device, surge prevention device, bearing temperature devices etc. Refer to individual operating instructions sheet for each specific item.

ALIGNMENT

The following procedure is applicable to direct driven machines only. Correct alignment will ensure a long life and trouble free operation of you blower/exhauster.

Misalignment is one of the most common causes of unit vibration and will cause premature bearing failure. NOTE: FINAL SHAFT ALIGNMENT IS THE RESPONSIBILITY OF THE INSTALLER/OWNER.

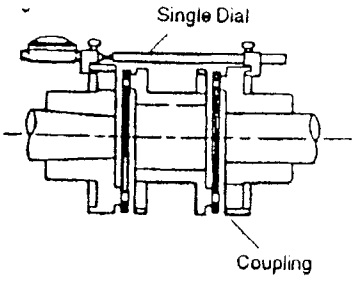
The manufacturer recommended alignment tolerance is +/- .005 inches parallel and .250 degree angular.

The following conditions can affect alignment and can be a factor in trying to achieve a good alignment.

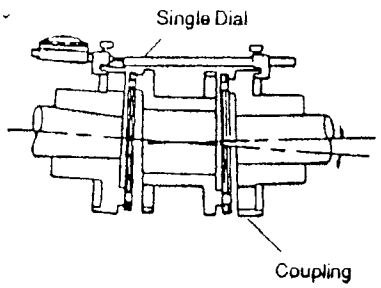
1. Base and foundation not level and smooth.
2. System piping not isolated with flexible sleeve or expansion joint.
3. Blower/exhauster base not mounted on vibration pads.
4. Blower/exhauster bolted down

NOTE: LACK OF VIBRATION ON START-UP DOES NOT INDICATE THAT THE UNIT IS IN PERFECT ALIGNMENT.

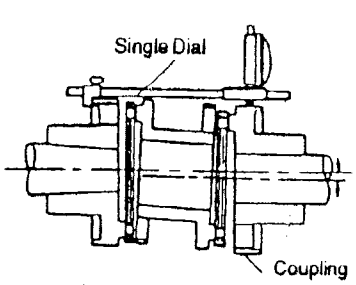
Alignment can be done by several different methods. A laser alignment is the most accurate and quickest method.



Coupling in Alignment



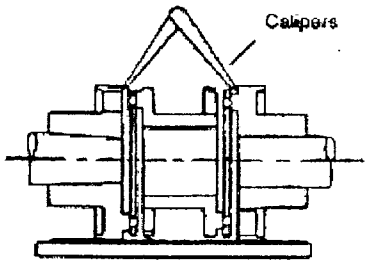
Angular Misalignment



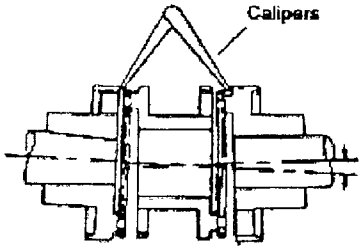
Parallel Misalignment

An acceptable, but not as accurate as the laser alignment, can be done by reverse dial indicator. This method involves the use of 2 brackets and measuring directly off the shafts.

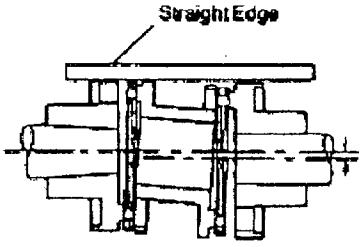
Other methods of coupling alignment would be: single dial indicator method, caliper method and straight edge method. Each of these is outlined below.



Coupling in Alignment



Angular Misalignment



Parallel Misalignment

Tools Needed For Alignment:

1. Calipers
2. Dial Indicator
3. Straight Edge
4. 6" Level

DIAL INDICATOR METHOD

Clamp dial indicator on driving (Motor) side of coupling. Locate indicator probe on the O.D. of the driven (Blower) half. Rotate shaft and take reading at 90-degree revolutions. Misalignment of coupling is ½ of total run-out. Locate indicator probe at the extreme point on the coupling face, rotate shaft and take readings at 180-degree revolutions. (See Figure 6,7, & 8)

STRAIGHT EDGE METHOD WITH TAPER GAUGE

Place a straight edge across the O.D.; rotate shaft and measure at 90-degree revolution. Insert feeler gauge and measure gap. (Misalignment will be equal to feeler gauge reading.) Use gauge to check the alignment at 180 degrees.

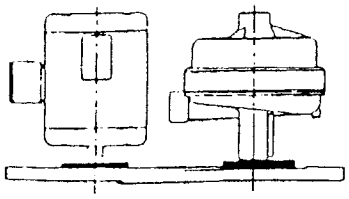
BELT DRIVEN ALIGNMENT:

Remove belt guard and inspect the belts and sheaves to insure that they are clean and dry. **DO NOT APPLY ANY BELT DRESSING.**

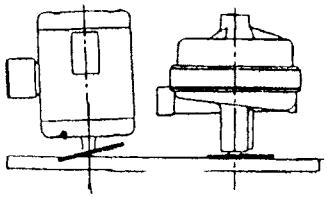
Placing a straight edge across the faces of both sheaves does alignment. If properly aligned the straight edge will contact both sheaves faces squarely. If the two faces do not meet then alignment can be adjusted by moving the motor into proper position as shown below.

Proper belt tension is important. This will ensure maximum belt and bearing life. Belt tension is done with a tension meter. These can be obtained at any local belt supply house. Follow the instructions supplied to determine proper belt tension.

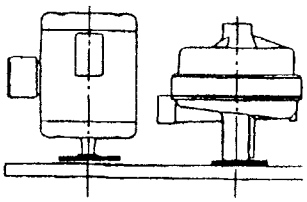
Belts will stretch after a few hours of operation. You should re-check the belt tension.



Proper Alignment



Angular



Parallel

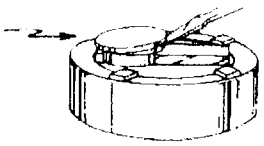
LUBRICATION

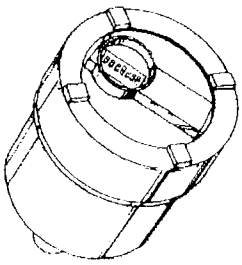
Your **NATIONAL TURBINE UNIT** is supplied with an electronic lubricator. These are shipped loose to prevent any possible damage in transit. **ISTALLATION OF THESE MUST BE DONE BEFORE START-UP OF EQUIPMENT.**

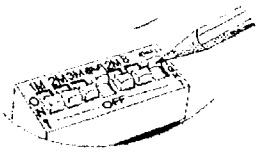
STARTING AND SETTING:

After installation of the automatic lubricator remove the switch cover. With a pencil turn on **ONLY** the switch marked 12. (The 12 setting will provide you with a 1-year supply of lubricant. This is based on 8 hours a day, 5 days a week operation.)

If a visual indicator of operation is desired then you can turn on the switch marked Light. This will provide a flashing LED light. The LED will flash every 15 seconds that the unit is in operation. It will take about 10 days for the lubricant to begin to flow. Your unit has been provided with pre-lubricated bearing to allow for this time lag.







BEARING REMOVAL & REPLACEMENT

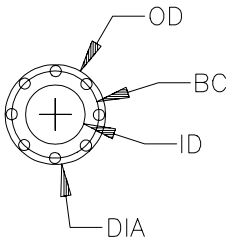
When a bearing becomes noisy it should be changed at once. You should change only one bearing at a time. **NEVER REMOVE BOTH BEARING AT THE SAME TIME. THIS WILL CHANGE INTERNAL SETTINGS AND DAMAGE TO ROTOR ASSEMBLY MAY RESULT.**

To remove bearing you must first loosen the two allen set screws located on bearing collar. Next remove the 4 nuts and pull bearing off shaft. Install new bearing on shaft, replace the 4 holding nuts and tighten down the allen set screws. **NOTE: AT THIS TIME YOU MUST LUBRICATE THE BEARING WITH HIGH TEMPERATRUE GREASE. GENERALLY 2 TO 3 PUMPS OF A GREASE GUN WILL DO. DO NOT RUN UNIT WITHOUT GREASE IN BEARINGS.**

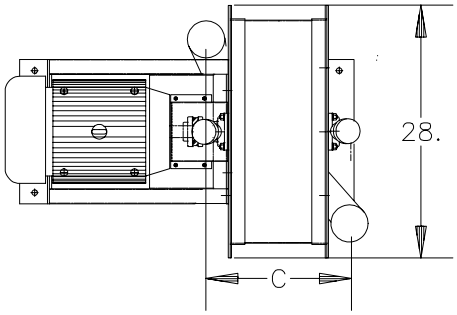
NATIONALTURBINE CORPORATION
374 Northern Lights Drive
Syracuse, NY 13212
888-293-7434 fax 315-455-5545
www.nationalturbine.com
sales@nationalturbine.com

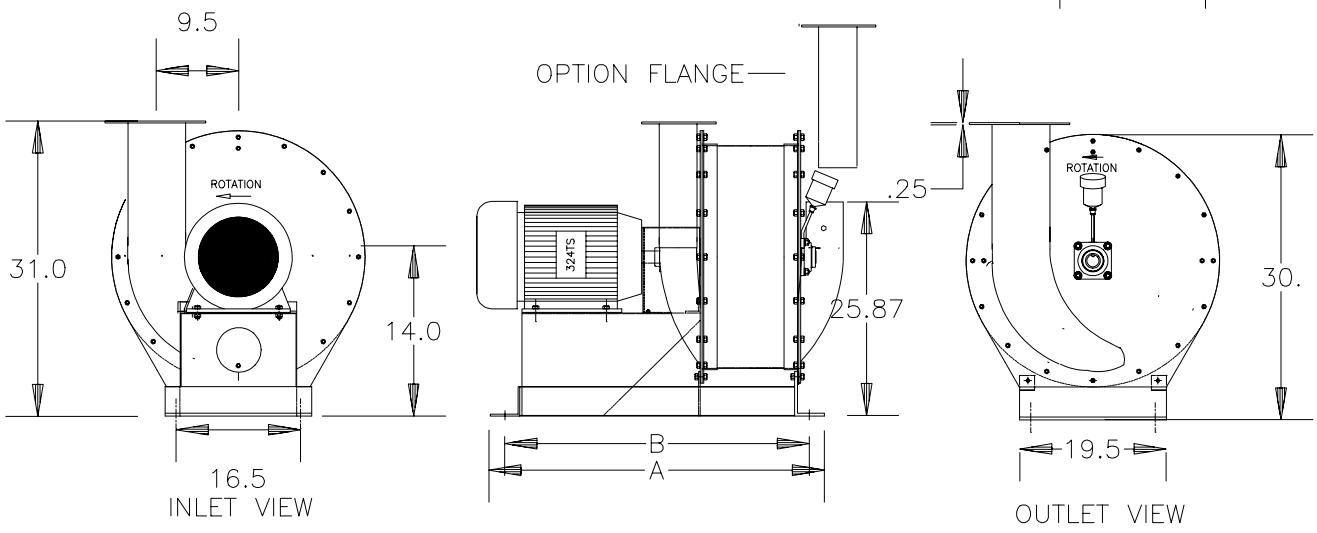
MILLENNIUM SERIES TECHNICAL DATA AND DIMENSIONS

M24 SERIES INLET DRIVE BLOWERS AND EXHAUSTERS



ID	OD	BC	DIA
5"	10"	8.5	.88





NUMBER OF STAGES	C DIM	A DIM	B DIM
2	20.0(508)	53 (1346)	49(1245)
3	20.0(508)	53(1346)	49(1245)
4	20.0(508)	53(1346)	49(1245)
5	24.0(635)	58 (1473)	54(1732)
6	24.0(635)	58(1473)	54(1732)

DIMENSIONS SUBJECT TO CHANGE WITHOUT NOTICE
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374 Northern Lights Drive
Syracuse, NY 13212
888-293-7434 fax 315-455-5545
www.nationalturbine.com
sales@nationalturbine.com

M24 Series

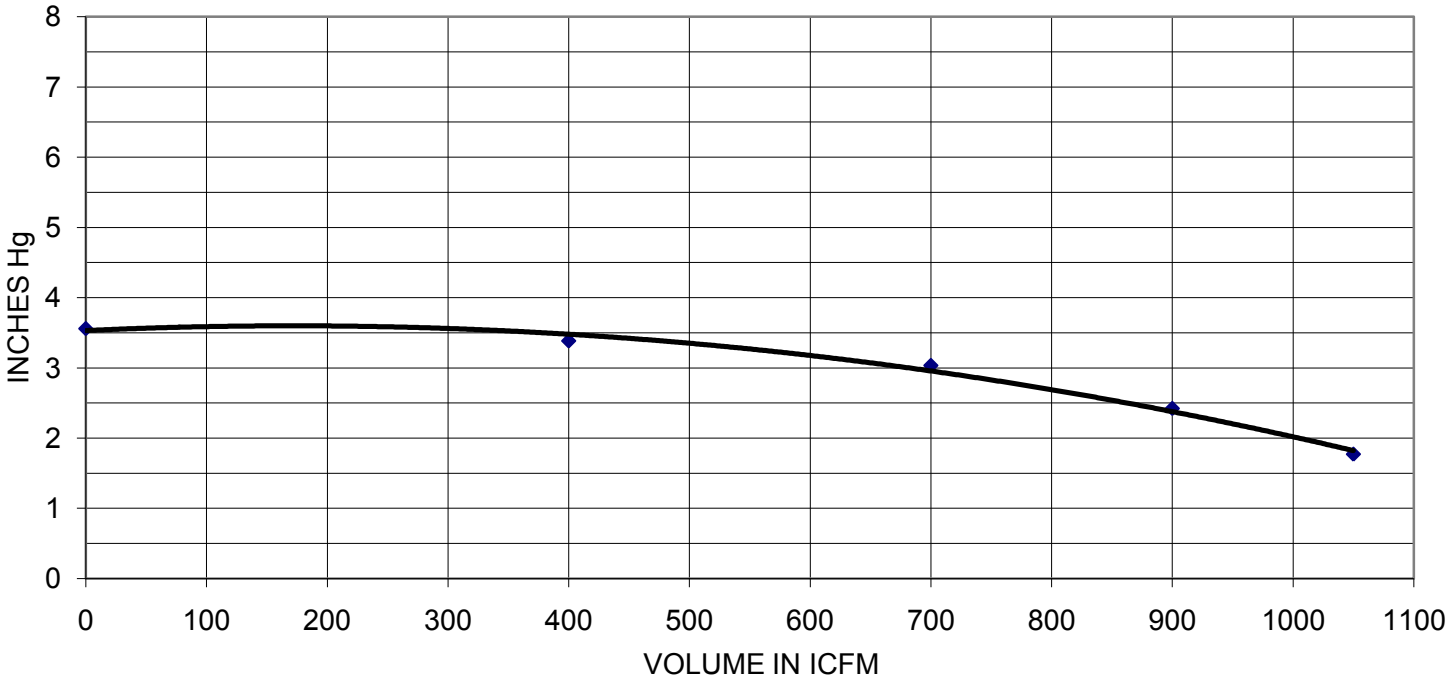
Technical Data

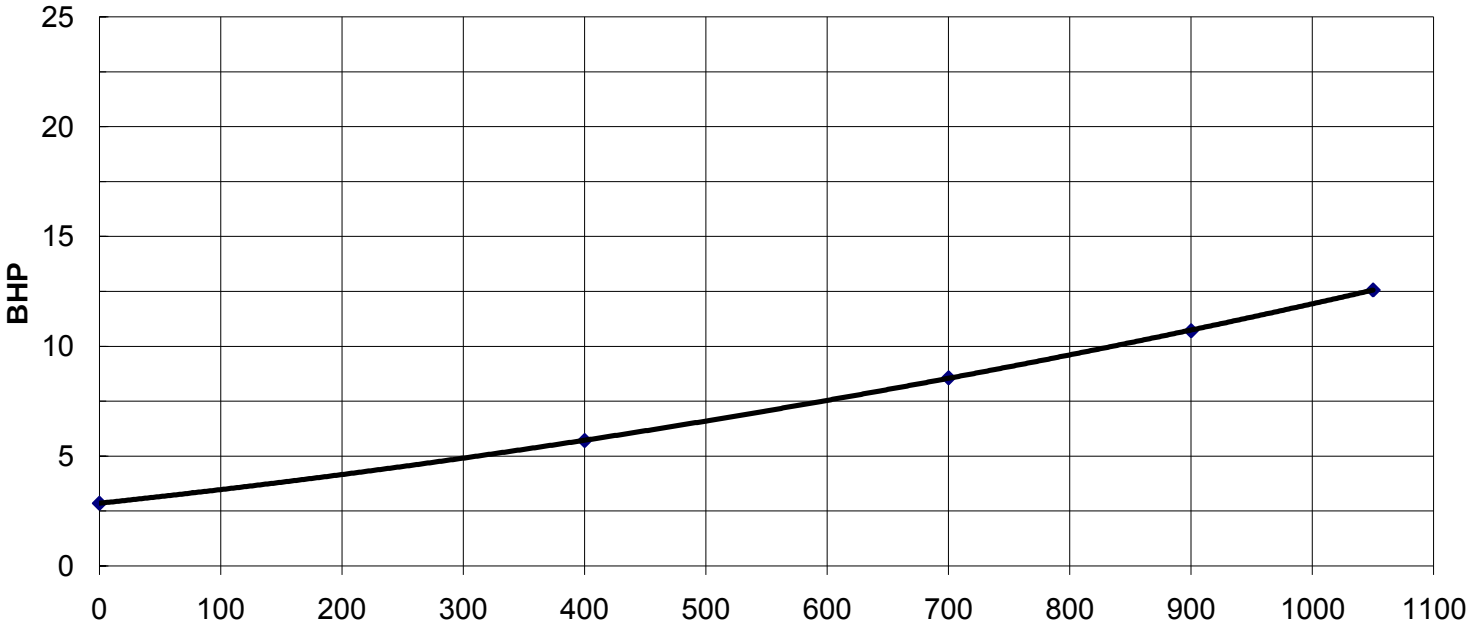
Number of Stages	1 through 6
Inlet Connection	5" ANSI flange
Outlet Connection	5" Tube (ANSI flange available)
Operating Speed	3525 RPM
Maximum Casing Pressure	15 PSIG
Bearings	Ball, self-aligning, flange mount 10 year B-10 life
Lubrication	Grease
Impeller Diameter	18.5" (470 mm)
Impeller Tip Speed	17,073 FPM (5204 m/min)
Drive	Direct coupled (belt drive available)
Drive Shaft Diameter	1.675" at coupling (42.5 mm)
Rotor Balance	Individually static and dynamically balanced to ISO standards

Materials of Construction

Inlet Head	1/4" Plate steel
Outlet Head	1/4" Plate steel
Casing	14 Gauge cold rolled steel
Tie Rods	Cold rolled steel
Joint Sealant	RTV silicone rubber
Shaft	Carbon steel, AISI 1045 (316 Stainless steel available)
Impellers	319 Cast aluminum-alloy
Base	Structural steel tubing
Motor Pedestal	Formed steel
Base Pads	Rubber
Finish	Industrial enamel

NATIONAL TURBINE CORPORATION
M24-318R EXHAUSTER
BAROMETER 29.92" Hg. TEMPERATURE 60F 3450 RPM





	National Turbine	No.:
		Date: 8/27/2009

Customer : Bisco Environmental

TECHNICAL PROPOSAL

Three-phase induction motor - Squirrel cage rotor

Product line	: W21 Severe Duty and General Purpose - High Efficiency - Three-Phase : ODP (IP21/IP23)
Catalog Number	: 00736OP3E184T
List Price	: $696

Notes:

Performed by:	Checked:

National Turbine

No.:

Date: 8/27/2009

DATA SHEET
Three-phase induction motor - Squirrel cage rotor

Customer	: Bisco Environmental
Product line	: W21 Severe Duty and General Purpose - High Efficiency - Three-Phase : ODP (IP21/IP23)

Frame	: 184T
Output	: 7.5 HP
Frequency	: 60 Hz
Poles	: 2
Full load speed	: 3485
Slip	: 3.19 %
Voltage	: 208-230/460 V
Full load current	: 19.8-17.9/8.97 A
Locked rotor current	: 126/62.8 A
Locked rotor current (Il/In)	: 7.0
No-load current	: 6.00/3.00 A
Full load torque	: 11.1 lb.ft
Locked rotor torque	: 220 %
Breakdown torque	: 300 %
Design	: B
Insulation class	: F
Temperature rise	: 80 K
Locked rotor time	: 13 s (hot)
Service factor	: 1.15
Duty cycle	: S1
Ambient temperature	: -20°C - +40°C
Altitude	: 1000 m
Degree of Protection	: IP21
Approximate weight	: 68 lb
Moment of inertia	: 0.16350 sq.ft.lb
Noise level	: ---

	D.E.	N.D.E.
Bearings	6206 ZZ	6205 ZZ
Regreasing interval	---	---
Grease amount	---	---

Load	Power factor	Efficiency (%)
100%	0.88	87.5
75%	0.85	87.5
50%	0.78	86.5

Notes:

Performed by:	Checked:

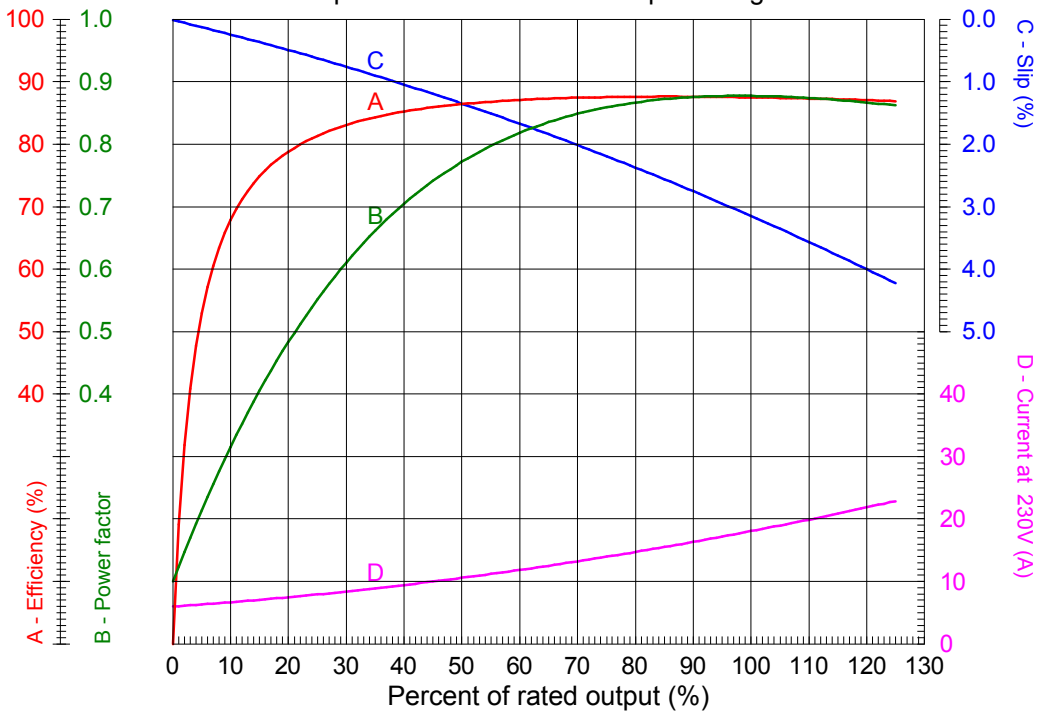
National Turbine

No.:

Date: 8/27/2009

PERFORMANCE CURVES RELATED TO RATED OUTPUT

Three-phase induction motor - Squirrel cage rotor



Customer	: Bisco Environmental
Product line	: W21 Severe Duty and General Purpose - High Efficiency - Three-Phase : ODP (IP21/IP23)

Output	: 7.5 HP	Locked rotor current (Il/In)	: 7.0
Frame	: 184T	Duty cycle	: S1
Full load speed	: 3485	Service factor	: 1.15
Frequency	: 60 Hz	Design	: B
Voltage	: 208-230/460 V	Locked rotor torque	: 220 %
Insulation class	: F	Breakdown torque	: 300 %
Full load current	: 19.8-17.9/8.97 A		

Notes:

Performed by:	Checked:

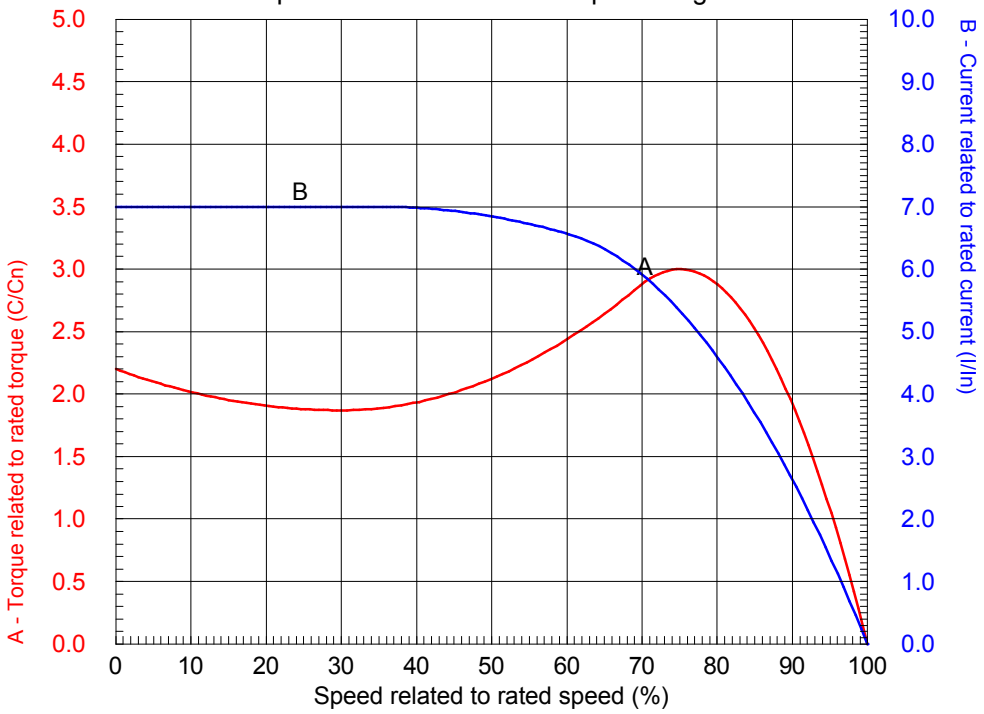
National Turbine

No.:

Date: 8/27/2009

CHARACTERISTIC CURVES RELATED TO SPEED

Three-phase induction motor - Squirrel cage rotor



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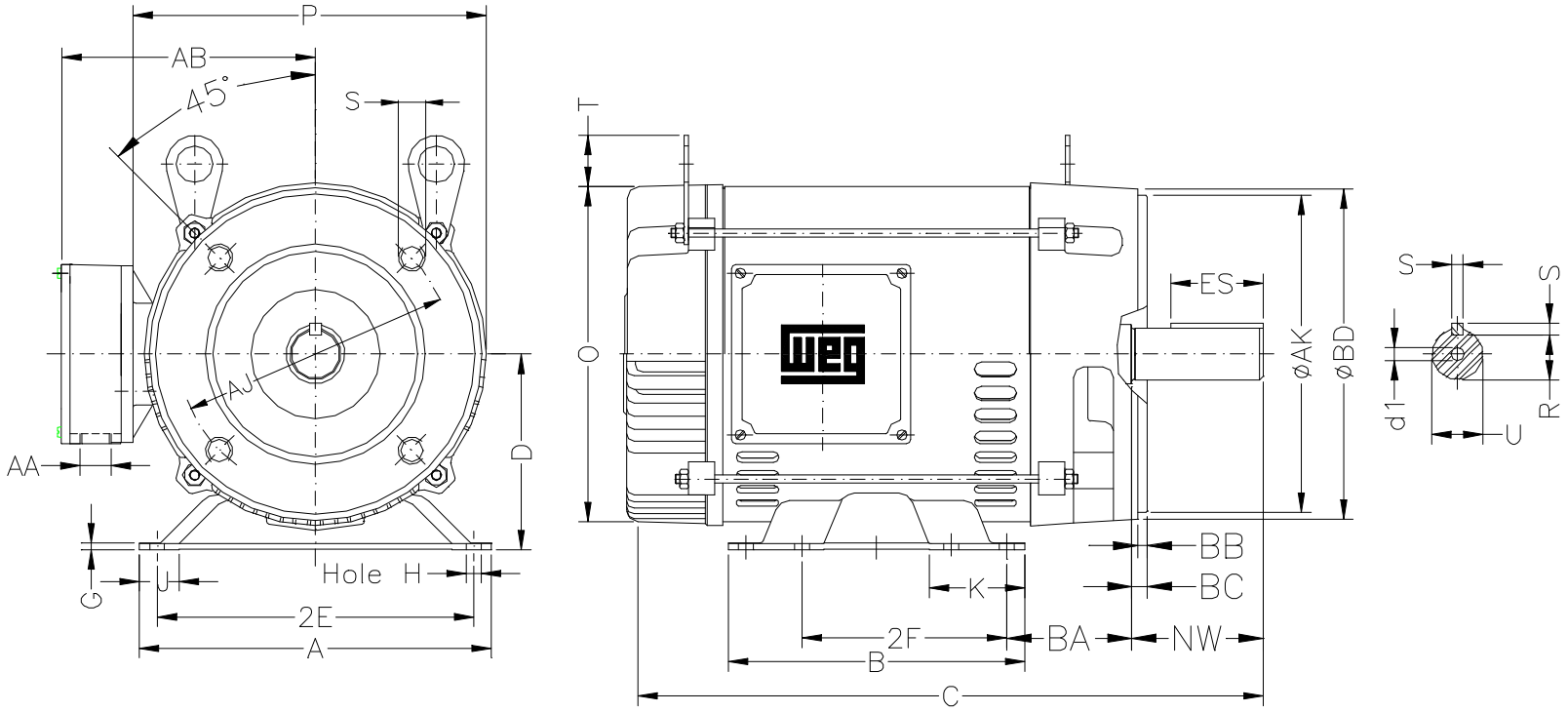
Notes:

Performed by:

Checked:



2E 7.500	2F 4.500/5.500	H 0.406	BA 2.750	A 8.661
B 6.299	C 14.291	D 4.500	G 0.187	J 1.171
K 1.988	O 8.307	P 7.637	T ---	ES 1.969
S 0.250	N-W 2.750	U 1.125	R 0.984	AB 6.575
AA NPT 3/4	d1 A4	Flange FC-184	AJ 7.250	AK 8.500
BD 8.875	BF UNC 1/2"x13	BB 0.250	BC 0.125	AH

Notes:

Performed by:

Checked:

Customer: Bisco Environmental

W21 Severe Duty and General Purpose - High Efficiency - Three-Phase : ODP (IP21/IP23)

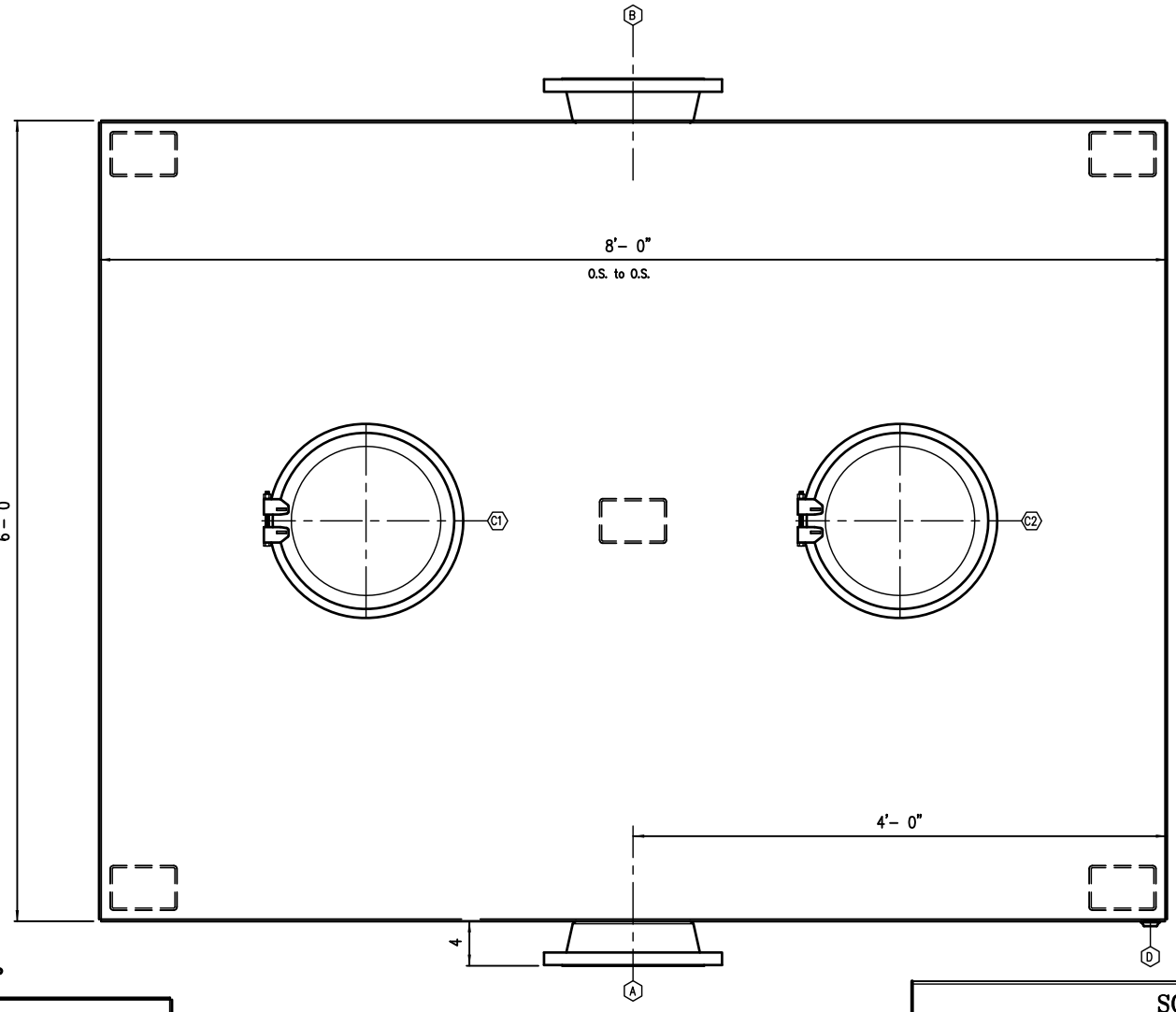
Three-phase induction motor

Frame 184T - IP21

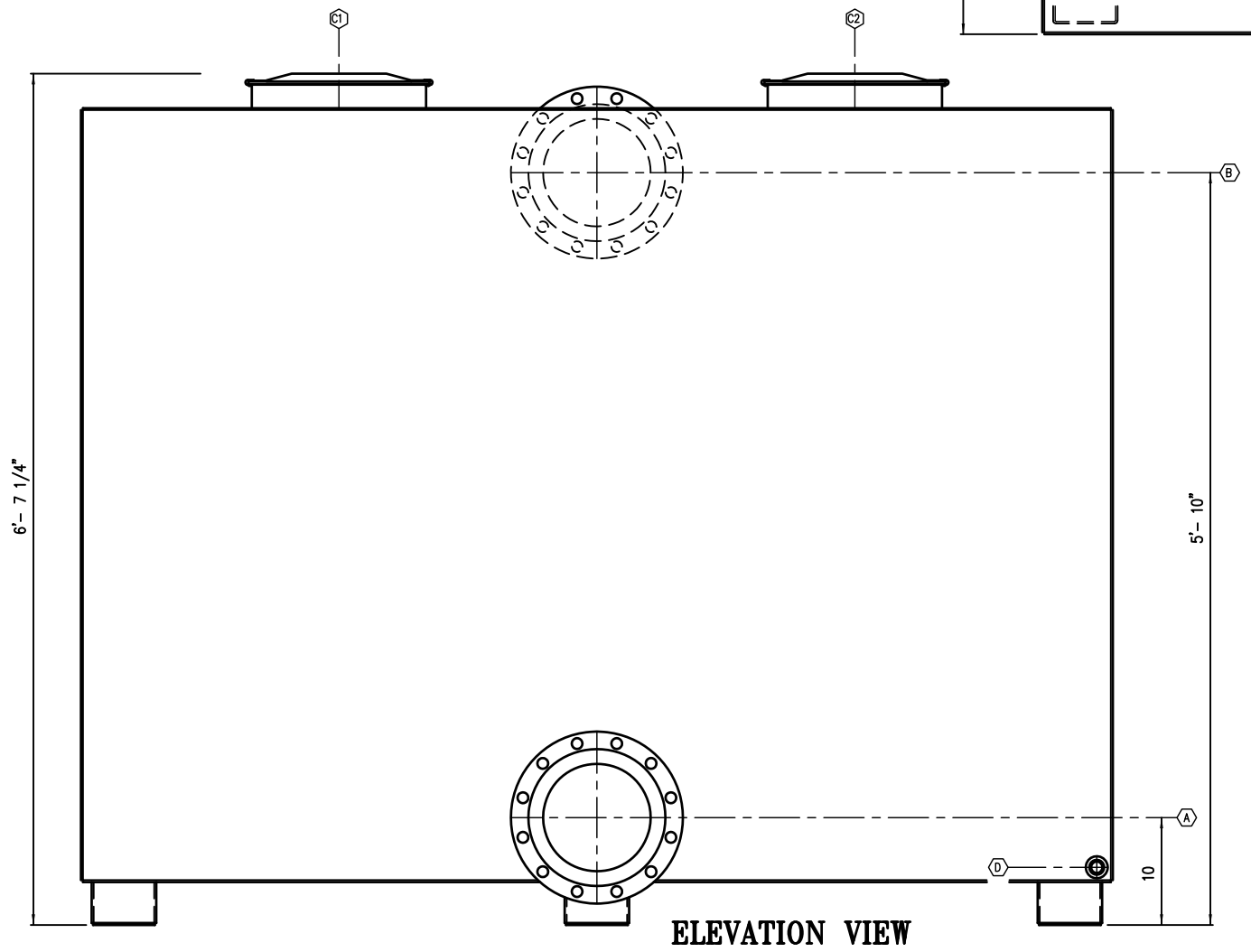
8/27/2009

Version

D-4
Vapor-phase Granulated Activated Carbon Unit VGAC-1



PLAN VIEW



ELEVATION VIEW

SCHEDULE OF OPENINGS

MARK	SIZE	QTY	RATING	TYPE	DESCRIPTION
A	10"	1	150#	RFWN	INLET
B	10"	1	150#	RFWN	OUTLET
C 1/2	16"	2	N/A	FF CMPRG	MANWAY c/w BLIND
D	3/4"	1	FNPT	WLD FLG	DRAIN
E					
F					
G					
H					

DESIGN DATA

Registration	NOT APPLICABLE	Year Built	2001
Construction	NOT APPLICABLE	Serial No.	00–____
Design Pressure	3 PSIG	Capacity (Vol.)	288 cu. ft.
Design Temperature	350 Deg F	Shipping Wt. (Empty)	2360 POUNDS
External Pressure	NOT APPLICABLE	Wt. full of water	_____ POUNDS
Min. Des. Metal Temp	–20 Deg F AT 3 PSIG	Gaskets	NEOPRENE
MAWP (New & Cold)	3 PSIG	Studs & Nuts	MILD STEEL (ZINC PLATED)
MAWP (Hot & Corr'd)	3 PSIG	Internal Surface Prep	INTERNAL POWER CLEAN
Hydro Test Pressure	N / A	External Surface Prep	EXTERNAL POWER CLEAN
Corrosion Allowance	NONE	Internal Coating	SERIES 120 POTAPOX PLUS 5–8 mils DFT
Radiography	NONE	External Coating	MAB PLYMASTIC (Lt GRAY) 5–7 mils DFT

PROPERTY OF
Tetrasolv Filtration
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Tetrasolv Filtration
WWW.TETRASOLV.COM
1200 EAST 26th STREET
ANDERSON, INDIANA 46016
Ph: (765) 643–3941
Fx: (765) 643–3949

REV	DESCRIPTION OF REVISIONS	BY	DATE

REV	DRAWING ISSUE RECORD	BY	DATE

CUSTOMER: Bisco Environmental

PROJECT: UNKNOWN

GENERAL ASSEMBLY LAYOUT – ELEVATION AND ORIENTATION
FOR
MODEL VF–5000 FILTER

DWN BY	CHK'D BY	APP'D BY	DATE	SCALE	JOB No.	DRAWING No.	REV
DB (TF)	TB (TF)	EP (TF)	FEB 20/01		UNKNOWN	VF5000–CD	0

Contents:

Liquid Filters

Vapor Filters

VFD Series
- VFD-30
- VFD-55
- VFD-85
- VFD-110

VFV Series

- VFV-250
- VFV-500
- VFV-1000
- VFV-2000
- VFV-3000
- VFV-5000
- VFV-10000

VF Series

- VF-500
- VF-1000
- VF-2000
- VF-3000
- VF-5000
- VF-10000

VR Series

- VR-140
- VR-170
- VR-225
- VR-400
- VR-700
- VR-1600
- VR-2600

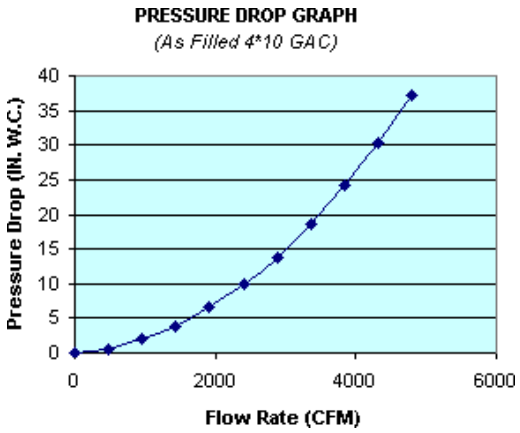
Filtration Media

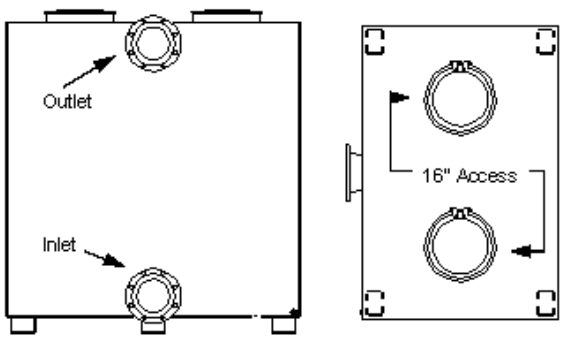
Special Products

VF SERIES FILTERS
MODEL VF-5000

The VF-5000 filter is a media filter vessel designed to treat vapor streams where pressure drop is a strong concern. While the typical design application is a activated carbon adsorbtion unit, the filter can easily accommodate many medias. The sturdy construction makes these filter vessels ideal for long term treatment units. Some applications include:

- Soil Vapor Extraction Treatment
- Air Stripper Off Gas Treatment
- Odor Removal System
- Storage Tank Purge Vapor Treatment
- Pilot Study
- Industrial Process Treatment





VF-10000 SPECIFICATIONS			
Overall Height	6'8''	Vessel/Internal Piping Materials	CS/ CS (False Floor)
Footprint	6' x 8'	Internal Coating	Polyamide Epoxy Resin
Inlet / Outlet (150# FLNG)	10"	External Coating	Epoxy Mastic (Light Grey)
Drain / Vent (FNPT)	3/4"	Maximum Pressure / Temp	2 PSIG / 250º F
GAC Fill (lbs)	5000	Cross Sectional Bed Area	48 FT^2
Shipping / Operational Weight (lbs)	7,100/8,200	Bed Depth/Volume	3.7 FT / 179 FT^3

Our Company | News | Catalog | Services | RFQs | Contact

Tetrasolv Filtration, Inc. • 1200 East 26th Street • Anderson, Indiana 46016 • USA
Toll Free: 800-441-4034 Telephone: 765-643-3941 • Fax: 765-643-3949
www.tetrasolv.com • info@tetrasolv.com

Contents:

Liquid Filters

Vapor Filters

Filtration Media
- Anthracite
- Birm®
- Re-Activated Carbon
- Virgin Carbon
- EC-100®
- Filter-Lite
- Manganese Greensand
- MTBE Removal Carbon
- Filter Sand

Special Products

FILTRATION MEDIA :
8x30 VIRGIN CARBON
4x10 VIRGIN CARBON

GENERAL DESCRIPTION

Select virgin carbon is quality screened during our purchasing process for activity, density and fines. The use of virgin carbon is recommended where drinking water quality is necessary. All carbon either sold by itself or installed in our filtration units is traced by lot number to the installation or sale.

8x30 (Liquid Phase) Standard Specifications:	Standard	Value
Iodine Number	ASTM D-4607	1200 Minimum
Moisture Content	ASTM D-2867	5% Maximum (as packed)
Particle Size	ASTM D-2862	8x30 US Mesh
Ash		10% Maximum
Total Surface Area (N2BET)		1050 Minimum
Pore Volume (cc/g)		0.75

4*10 (Vapor Phase) Standard Specifications:	Standard	Value
Carbon Tetrachloride Activity Level	ASTM D-3467	60 Minimum
Moisture Content	ASTM D-2867	5% Maximum (as packed)
Particle Size	ASTM D-2862	4x10 US Mesh
Ash		10% Maximum
Total Surface Area (N2BET)		1050 Minimum
Pore Volume (cc/g)		0.75

Packaging:		
50 Pound Bags	50 Pound Drums	Bulk Tanker
1,000 Pound Bulk Sacks	200 Pound Drums	

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D-5
Condensate Pump P-1

Pump, Utility, 1/2 HP

Pumps > Centrifugal > Self Priming Portable Utility

Utility Pump, Portable, Self-Priming, 1/2 HP, 1 Phase, Voltage 115, 8.0 Amps, 60 Hz, Inlet 3/4 NPT In., Outlet 3/4 NPT In., Motor Enclosure ODP, 7000 RPM, Impeller Material Thermoplastic, Housing Material Cast Iron, Seal Type Mechanical, Suction Lift 15 Ft., Max. Head 101 Ft., Max. Pressure 44 PSI, Cord 10, Impeller Type Open, Max. Dia. Solids 3/8 In., Height 8 In., Length 9.5 In., Width 5.75 In.

Grainger Item #	4CB57
Price (ea.)	**$172.50**
Brand	DAYTON
Mfr. Model #	4CB57
Ship Qty.	1
Sell Qty. (Will-Call)	1
Ship Weight (lbs.)	14.5
Usually Ships**	Today
Catalog Page No.	3387
Country of Origin	China

Enlarge Image

See Notes & Restrictions for important safety information.

Qty.

Add Grainger TripleGuard® repair & replacement coverage for $35.95 each.

Add to Order | Add to Personal List | Compare Alternates

Price shown may not reflect your price. Sign in or register.

Tech Specs | Additional Information | Notes & Restrictions | MSDS | Required Accessories | Optional Accessories | Alternate Products | Repair Parts

Item	Utility Pump
Type	Portable, Self-Priming
HP	1/2
Phase	1
Voltage	115
Amps	8.0
Hz	60
Inlet (In.)	3/4 NPT
Outlet (In.)	3/4 NPT
Motor Enclosure	ODP
RPM	7000
Motor Type	AC/DC Brush
Wetted Materials	Cast Iron, Plastic, Carbon, Ceramic, Buna N Galvanized Steel, Brass
Impeller Material	Thermoplastic
Housing Material	Cast Iron
Volute Material	Cast Iron
Shaft Material	Cold rolled steel
Screw Material	Zinc coated Steel
Seal Type	Mechanical
Seal Material	Carbon, Ceramic, Buna N
Seal Application	Nonflammable and Nonabrasive Liquids compatible with seal component materials up to 104°F
Max. Liquid Temp. (F)	104
Suction Lift (Ft.)	15
GPH of Water @ 5 PSI	840
GPH of Water @ 10 PSI	828
GPH of Water @ 15 PSI	800

GPH of Water @ 20 PSI	714
GPH of Water @ 25 PSI	647
GPH of Water @ 30 PSI	571
GPH of Water @ 35 PSI	484
GPH of Water @ 40 PSI	270
GPM of Water @ 5 Ft. of Head	14
GPM of Water @ 10 Ft. of Head	13.8
GPM of Water @ 20 Ft. of Head	11.9
GPM of Water @ 40 Ft. of Head	4.5
Max. Head (Ft.)	101
Max. Pressure (PSI)	44
Cord	10 ft.
Best Efficiency GPM @ Head (Ft.)	N@A
Max. Specific Gravity	1.0
Max. Case Pressure (PSI)	44
Max. Fluid Viscosity	100 SSU
Impeller Type	Open
Bearing Type	Ball
Duty	Intermittent
Max. Dia. Solids (In.)	3/8
Warranty Length	1 Year
Application	Is designed for water transfer applications including emptying or filling tanks, lawn sprinkling, and drawing water from lakes and ponds.
For Use With	Nonflammable Liquids Compatible with Pump Materials
Height (In.)	8
Length (In.)	9.5
Width (In.)	5.75
Includes	1" MFNPT x 3/4" Garden hose adapters, Suction Strainer, 3 Rubber Feet for Pump

View Catalog Page View Printable Page

The "Usually Ships" reflects when an item is generally expected to ship from Grainger based on its stocking location. Real-time availability information will be shown during the checkout process and on the e-mail order confirmation (for U.S. and Puerto Rico - US customers only). Please allow additional delivery time for international orders.

We Also Carry

Coupling, Swivel 1/2 FNPTx3/4 Inch NH(F)
Grainger Item #: 4KG87
Price (ea.): $3.99
Brand: WESTWARD
Qty.
Add to Order
Add to Personal List

Vacuum, Wet/Dry, 6 G
Grainger Item #: 3VE18
Price (ea.): $66.60
Brand: DAYTON
Qty.
Add to Order
Add to Personal List

Air Gun Kit, 5 Pc Lever, 3 3/4 OAL, Zinc
Grainger Item #: 1KUC9
Price (ea.): $36.35
Brand: LEGACY
Qty.
Add to Order
Add to Personal List

Eyewash
Grainger Item #: 2AL41
Price (ea.): $3.79
Brand: NORTH BY HONEYWELL
Qty.
Add to Order
Add to Personal List

Air Gun, Lever, 4 1/4 OAL, Zinc Die Cast
Grainger Item #: 1KUB8
Price (ea.): $11.99
Brand: LEGACY
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D-6
Pressure / Vacuum Switches and Pressure / Vacuum Gauges

B-Series Switches – Pressure, Differential Pressure, Temperature & Hydraulic

FEATURES

B-Series switches have proven reliable in such harsh environments as:

- ***Offshore oil rigs***
- ***Chemical and petrochemical plants***
- ***Pulp and paper mills***
- ***Steel mills***
- ***Power plants***
- ***Water and sewage-treatment plants***
- ***Other corrosive environments***

Ashcroft Inc. supplies highly reliable Ashcroft® switches and controls for industrial and process applications. We begin with rock-solid designs, matching the most appropriate technology with the safety and reliability requirements of the applications. The materials of construction are specified to Ashcroft's exacting standards, and product is built to last in the toughest applications. Our modern, responsive manufacturing facility is supported by an extensive network of stocking distributors and factory sales offices located in virtually every part of the world. Special application assistance is always just a telephone call away.

The Ashcroft B-Series switch line is designed to satisfy most switch requirements. Materials of construction have been selected for long life. A wide variety of precision switch elements are available to meet every application requirement, including hermetically sealed contacts for added reliability and safety. The actuators we use have been proven in more than 20 years of service in the world's plants and mills. Special designs are available for fire safety, NACE, limit control and other more stringent requirements. Simplicity and ease of use are stressed to improve reliability of the installation.

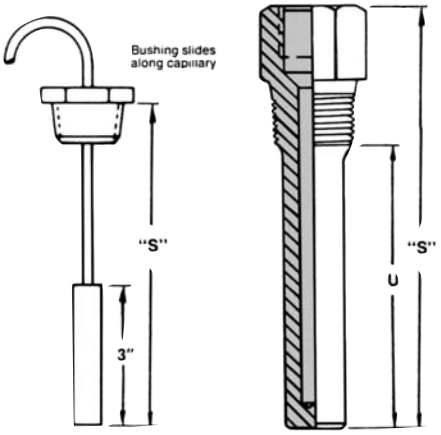
Applications include: pumps, compressors, washers, filters, degreasers, evaporators, recovery systems, food processing, ground support equipment, reverse osmosis systems, heat exchangers, hydraulic systems, lubrication systems, marine equipment, textile machinery, heating and air conditioning equipment.

Thermowells

Thermowells must be used on any application where the stem of the temperature switch may be exposed to pressure, corrosive fluids or high velocity. Additionally, the use of a thermowell permits instrument interchange or calibration check without disturbing or closing down the process.

Ashcroft temperature switches have bulb diameters to match ⅜″ nominal bore thermowells. The bulbs have a sensitive portion length of 2″ which can be used with 2½″ "U" dimensioned thermowells or longer. For maximum accuracy, a thermowell's "U" dimension should be selected to permit complete immersion of the sensitive portion plus 1″ when measuring the temperature of liquids; an extra 3″ should be allowed when measuring the temperature of gases.

Thermowell bushings should be used with remote mount temperature switches. We recommend the standard 3″ bulb and code 69 Series bushings for use with any thermowell "U" dimension. A split rubber grommet allows easy installation and "S" dimension adjustment.



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B-Series Switches – Pressure, Differential Pressure, Temperature & Hydraulic

Temperature Switches

B-Series temperature switches feature a SAMA Class II vapor pressure thermal system. This system provides quick, accurate response to process temperature changes with negligible ambient temperature effects. This is inherent in the design due to the precise relationship that exists between temperature and pressure according to the vapor pressure laws. A wide selection of sensing bulb and armored capillary lengths is available. The vapor pressure system design features small bulb sizes, making installation easy and cost-effective.

All models feature ±1.0% percent of span setpoint repeatability with very high overtemperature ratings.

These standard designs perform well in applications where shock and vibration could be a problem and should be used with Ashcroft thermowells for bulb protection and ease of installation and maintenance.

STANDARD TEMPERATURE RANGE SELECTION

Nominal Range(1)		Maximum Temperature	Approximate Deadband(1) Switch Element				
°F	°C	°F	20, 26, 27	21, 24, 31	50	22	32, 42
–40 to 60	–40 to 16	400	1.0-2.0	3.0-8.0	1.5-5.5	1.4-6.0	8.0-16.0
0 to 100	–20 to 40	400	1.5-3.0	5.0-12.0	2.2-8.5	1.5-7.5	9.0-20.0
75 to 205	20 to 95	400	1.5-3.5	8.0-16.0	2.5-12.0	2.0-9.0	10.0-24.0
150 to 260	65 to 125	400	1.5-3.0	5.0-12.0	2.2-8.5	2.0-9.0	10.0-24.0
235 to 375	110 to 190	500	1.5-3.5	5.0-12.0	2.5-8.5	2.0-9.0	10.0-24.0
350 to 525(3)	175 to 275	700	2.0-4.5	8.0-16.0	3.2-12.0	2.5-10.0	15.0-34.0
500 to 750(2)	260 to 400	900	4.0-8.0	16.0-30.0	7.2-24.0	5.0-23.0	30.0-50.0

NOTES:

1 All deadbands given in °F.
2 Available with remote mount thermal systems only.
3 Not available with 2¾″ stem.
4 Dual switch element multiply single switch element value by 1.6 for approximate deadband.
5 Set and reset points must fall within the adjustable range.

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B-Series Switches – Pressure, Differential Pressure, Temperature & Hydraulic

Pressure & Differential Pressure Switches

B-Series pressure, differential pressure and vacuum switches use two different actuators depending on setpoint require-ments. For set-points between 2 and 3000 psi, the simple, rugged diaphragm-sealed piston actuator is used. This design features high reliability and choice of actuator seal materials for virtually every application. An optional welded design is also available for setpoints up to 1000 psi for of construction.

All standard models feature ±1 percent of range setpoint repeatability and a minimum of 400 percent of range proof pressures.

These standard designs perform well in appli-cations where shock and vibration could be a problem and may be used in conjunction with Ashcroft diaphragm seals in extreme services such as slurries or abrasive process fluids.

maximum reliability. This design is available in 316 SS or Monel. Differential pressure models use a unique, dual diaphragm-sealed piston design that features very high static operating pressures and small size.

For setpoints between 4.5 and 150 inches of H_2O, a large diaphragm is used for increased sensitivity in both pressure and differential pressure designs with good choice of materials

PRESSURE/VACUUM SWITCHES

Nominal Range[1]			Overpressure Ratings		Approximate Deadband[2] Switch Element				
			Proof psi	Burst psi	20, 26, 27	21, 24, 31	50	22	32, 42
Vacuum									
–30˝ Hg	–760mm Hg	-100 kPa	250	400	0.3-0.7	1.5-3.0	0.5-2.2	0.4-1.5	2.1-4.2
Compound									
–15˝ H_2O/	–375mm H_2O/	–3.7 kPa/	20	35	0.15-.75/	1.5-2.5/	0.45-2.0/	0.5-1.2/	2.1-3.5/
15˝ H_2O	375mm H_2O	3.7 kPa			0.15-.75	1.5-2.5	0.45-2.0	0.5-1.2	2.1-3.5
–30˝ H_2O/	–760mm H_2O/	–7.5 kPa/	20	35	0.30-.60/	1.5-2.5/	0.45-2.0/	0.5-1.5/	2.1-3.5/
30˝ H_2O	760mm H_2O	7.5 kPa			0.30-.60	1.5-2.5	0.45-2.0	0.5-1.5	2.1-3.5
–30˝ Hg/	–760mm Hg/	–100 kPa/			0.5-1.0/	2.0-3.0/	0.75-2.5/	0.7-1.8/	2.8-4.2/
15 psi	1.0 kg/cm²	100 kPa	250	400	0.3-0.7	0.5-1.5	0 .5-1.0	0.7-1.4	0.7-2.1
–30˝ Hg/	–760mm Hg/	–100 kPa/			1.0-1.5/	3.0-6.0/	1.2-4.5/	1.4-2.4	4.2-8.4/
30 psi	2.0 kg/cm²	200 kPa	250	400	0.3-0.8	1.0-2.0	0.7-1.5	0.4-1.3	1.4-2.8
–30˝ Hg/	–760mm Hg/	–100 kPa/			2.0-3.0/	5.0-9.0/	2.5-7.0/	2.8-4.5	7.0-12.0/
60 psi	4.0 kg/cm²	400 kPa	250	400	0.7-1.5	3.0-5.0	1.1-4.0	1.0-2.3	4.2-7.0
Pressure									
10˝ H_2O	250mm H_2O	2.5 kPa	20	35	0.2-0.5	1.0-2.0	0.35-1.5	0.4-1.0	1.4-2.8
30˝ H_2O	750mm H_2O	7.5 kPa	20	35	0.3-0.6	1.5-2.5	0.45-2.0	0.5-2.0	2.1-3.5
60˝ H_2O	1500mm H_2O	15 kPa	20	35	0.5-1.3	1.5-3.5	0.9-2.5	0.7-3.0	2.1-5.0
100˝ H_2O	2500mm H_2O	25 kPa	20	35	0.6-1.6	2.5-5.5	1.1-4.0	1.0-4.0	3.5-7.7
150˝ H_2O	3750mm H_2O	37 kPa	20	35	1.0-2.5	4.5-8.5	1.7-6.5	2.0-6.0	6.0-12.0
15 psi	1.0 kg/cm²	100 kPa	500	1500	0.1-0.35	0.5-1.5	0.2-1.0	0.4-1.0	0.7-2.1
30 psi	2.0 kg/cm²	200 kPa	500	1500	0.1-0.50	0.5-1.5	0.3-1.0	0.4-1.0	0.7-2.1
60 psi	4.0 kg/cm²	400 kPa	500	1500	0.3-1.0	1.0-3.5	0.7-2.5	0.6-2.0	1.4-5.0
100 psi	7.0 kg/cm²	700 kPa	1000	3000	0.5-1.7	1.5-5.0	1.1-3.5	1.0-4.5	2.1-7.0
200 psi	14 kg/cm²	1400 kPa	1000	3000	1-3	5-13	2-9	3.0-7.5	7.0-18.2
400 psi	28 kg/cm²	2800 kPa	2400	3000	4-7.5	5-24	5.5-15	4.0-11.0	7.0-33.6
600 psi	42 kg/cm²	4200 kPa	2400	3000	4-11	9-30	7-20	5.0-23.0	12.6-42
1000 psi	70 kg/cm²	7000 kPa	12000	18000	7-30	30-110	18-70	15-80	42-154
3000 psi	210 kg/cm²	2100 kPa	12000	18000	15-60	80-235	37-160	30.0-230	112-329

DIFFERENTIAL PRESSURE SWITCHES

Nominal Range[1]			Pressure Ratings		Approximate Deadband[2] Switch Element				
			Static Work-ing Pressure	Proof psi	20, 26, 27	21, 24, 31	50	22	32, 42
30˝ H_2O	750mm H_2O	7.5 kPa	5.4	21.6	0.3-0.6	1.5-2.5	0.45-2.0	0.5-2.0	2.1-3.5
60˝ H_2O	1500mm H_2O	15 kPa	5.4	21.6	0.5-1.3	1.5-3.5	0.9-2.5	0.7-3.0	2.1-5.0
100˝ H_2O	2500mm H_2O	25 kPa	5.4	21.6	0.6-1.6	2.5-5.5	1.1-4.0	1.0-4.0	3.5-7.7
150˝ H_2O	3750mm H_2O	37 kPa	5.4	21.6	1.0-2.5	4.5-8.5	1.8-6.5	2.0-6.0	6.3-12.0
15 psid	1.0 kg/cm²	100 kPa	500	2000	0.5-1.0	2.0-5.0	0.7-3.5	0.7-1.4	2.8-7.0
30 psid	2.0 kg/cm²	200 kPa	500	2000	1.0-2.0	2.0-5.0	1.5-3.5	1.4-2.8	2.8-7.0
60 psid	4.0 kg/cm²	400 kPa	500	2000	2.0-4.0	3.0-6.0	3.0-4.5	2.8-5.6	4.2-8.5
100 psid	7.0 kg/cm²	700 kPa	1000	4000	4.0-10.0	11.0-20.0	7.0-15.0	6.0-14.0	16.0-28.0
200 psid	14.0 kg/cm²	1400 kPa	1000	4000	5.0-15.0	12.0-40.0	10.0-26.0	7.0-21.0	17.0-56.0
400 psid	28.0 kg/cm²	2800 kPa	1000	8000	10.0-20.0	20.0-60.0	15.0-40.0	14.0-28.0	28.0-84.0
600 psid	42 0 kg/cm²	4200 kPa	1000	8000	20.0-40.0	80.0-150.0	30.0-115.0	30.0-56.0	112.0-210.0

Values shown are for zero static working pressure.

NOTES:

1 Switches may generally be set between 15% and 100% of nominal range on increasing pressure. Consult factory for applications where setpoints must be lower.

2 All deadbands are given in English units as shown in the nominal range column. Deadbands shown are for switches with Buna N diaphragm. Approximate deadbands for optional diaphragms:

Viton:	Multiply Buna N value by 1.4
Teflon:	Multiply Buna N value by 1.2
Stainless Steel:	Multiply Buna N value by 1.7
Monel:	Multiply Buna N value by 1.7
Dual Switch Element:	Multiply single switch element value by 1.6 for approximate deadband.

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B-Series Switches – Pressure, Differential Pressure, Temperature & Hydraulic

B-SERIES PRESSURE AND DIFFERENTIAL PRESSURE SWITCH MODEL NUMBER:

To specify the exact switch desired, select entries from appropriate tables as shown in example below.

1		2		3	4			5
B	4	2	0	B	X	P	K	600 PSI

1 – ENCLOSURE	
B4	Pressure switch, Type 400, watertight enclosure meets NEMA 3, 4, 4X, 13 and IP66 requirements.
B7	Pressure switch, Type 700, explosion-proof enclosure meets Div. 1 & 2, NEMA 7, 9 and IP66 requirements.
D4	Differential pressure switch, Type 400, water-tight enclosure meets NEMA 3, 4, 4X, 13 and IP66 requirements.
D7	Differential pressure switch, Type 700, explosion-proof enclosure meets Div. 1 & 2, NEMA 7, 9 and IP66 requirements.

3 – ACTUATOR SEAL					
		Range			
Code and Material	**Process Temperature Limits °F[9]**	**Vac. ˝ H_2O**	**0-600 psi**	**1000 psi**	**3000 psi**
B – Buna-N	0 to 150	•	•	•	•
V – Viton	20 to 300	•	•	•	
T – Teflon	0 to 150	•	•	•	•
S – 316L[8]	0 to 300		•	•	
P – Monel[8]	0 to 300		•	•	

4 – OPTIONS	5 – RANGE
Use table from page 6	Select from table on page 4

NOTES:

1 Standard switch.
2 Not available with psid ranges.
3 Dual switches are 2 SPDT snap-action switches, not independently adjustable.
4 Wires cannot be terminated inside B400 switch enclosure.
5 Not available with type 700 enclosure.
6 Estimated dc. rating, 2.5A, 28 Vdc (not UL listed).
7 Estimated dc rating, 0.4A, 120 Vdc (not UL listed).
8 Available on pressure only.
9 Ambient operating temperature limits –20 to 150°F, all styles, setpoint shift of ±1% of range per 50°F temperature change is normal. Switches are calibrated at 70°F reference.

2 – SWITCH ELEMENT SELECTION		
Order Code	**Switch Elements UL/CSA Listed SPDT**	
20[7]	Narrow deadband ac	15A, 125/250 Vac
21	Ammonia service	5A, 125/250 Vac
22[6]	Hermetically sealed switch, narrow deadband	5A, 125/250 Vac
23	Heavy duty ac	22A, 125/250 Vac
24[1]	General purpose	15A, 125/250/480 Vac ½A, 125 Vdc ¼A, 250 Vdc; 6A, 30 Vdc
25[2]	Heavy duty dc	10A, 125 Vac or dc, ⅛ HP, 125 Vac or dc
26[7]	Sealed environment proof	15A, 125/250 Vac
27	High temperature 300°F	15A, 125/250 Vac
28[5]	Manual reset trip on increasing	15A, 125/250 Vac
29[5]	Manual reset trip on decreasing	15A, 125/250 Vac
31	Low level (gold) contacts	1A, 125 Vac
32	Hermetically sealed switch, general purpose	11A, 125/250 Vac 5A, 30 Vdc
42	Hermetically sealed switch, gold contacts	1A, 125 Vac
50	Variable deadband	15A, 125/250 Vac
UL/CSA Listed Dual (2 SPDT)		
61[7]	Dual narrow deadband	15A, 125/250 Vac
62[7]	Dual sealed environment proof	15A, 125/250 Vac
63	Dual high temp. 300°F	15A, 125/250 Vac
64	Dual general purpose	15A, 125/250/480 Vac ½A, 125 Vdc ¼A, 250 Vdc
65	Dual ammonia service	5A, 125/250 Vac
67[4,6]	Dual hermetically sealed switch, narrow deadband	5A, 125/250 Vac
68[4]	Dual hermetically sealed switch, general purpose	11A, 125/250 Vac 5A, 30 Vdc
70	Dual low level gold contacts	1A, 125 Vac
71[4]	Dual hermetically sealed switch, gold contacts	1A, 125 Vac

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B-Series Switches – Pressure, Differential Pressure, Temperature & Hydraulic

B-SERIES TEMPERATURE SWITCH MODEL NUMBER:

To specify the exact switch desired, select entries from appropriate tables as shown in example below.

1	2	3	4	5	6
T	4	2 0	T 0 5	030	X N H	150° to 260°F

1 – ENCLOSURE	
T4	Temperature switch, Type 400, watertight enclosure meets NEMA 3, 4, 4X, 13 and IP66 requirements.
T7	Temperature switch, Type 700, explosion-proof enclosure meets Div. 1 & 2, NEMA 7, 9 and IP66 requirements.

2 – SWITCH ELEMENT SELECTION		
Order Code	**Switch Elements UL/CSA Listed SPDT**	
20[7]	Narrow deadband ac	15A, 125/250 Vac
21	Ammonia service	5A, 125/250 Vac
22[6]	Hermetically sealed switch, narrow deadband	5A, 125/250 Vac
23	Heavy duty ac	22A, 125/250 Vac
24[1]	General purpose	15A, 125/250/480 Vac ½A, 125 Vdc ¼A, 250 Vdc; 6A, 30 Vdc
25	Heavy duty dc	10A, 125 Vac or dc, ⅛ HP, 125 Vac or dc
26[7]	Sealed environment proof	15A, 125/250 Vac
27	High temperature 300°F	15A, 125/250 Vac
28[5]	Manual reset trip on increasing	15A, 125/250 Vac
29[5]	Manual reset trip on decreasing	15A, 125/250 Vac
31	Low level (gold) contacts	1A, 125 Vac
32	Hermetically sealed switch, general purpose	11A, 125/250 Vac 5A, 30 Vdc
42	Hermetically sealed gold contacts	1A, 125 Vac
50	Variable deadband	15A, 125/250 Vac
UL/CSA Listed Dual (2 SPDT)		
61[7]	Dual narrow deadband	15A, 125/250 Vac
62[7]	Dual sealed environment proof	15A, 125/250 Vac
63	Dual high temp. 300°F	15A, 125/250 Vac
64	Dual general purpose	15A, 125/250/480 Vac ½A, 125 Vdc ¼A, 250 Vdc
65	Dual ammonia service	5A, 125/250 Vac
67[4,6]	Dual hermetically sealed switch, narrow deadband	5A, 125/250 Vac
68[4]	Dual hermetically sealed switch, general purpose	11A, 125/250 Vac 5A, 30 Vdc
70	Dual low level gold contacts	1A, 125 Vac
71[4]	Dual hermetically sealed switch, gold contacts	1A, 125 Vac

3 – THERMAL SYSTEM SELECTION			
Direct Mount			
Order Code	**System Material**		**Style**
TS	3l6 SS		Rigid
Remote Mount			
Order Code	**System Material**	**Line Length**	**Style**[9]
T05	316 SS	5′	Capillary with 302 SS Spring Armor
T10	316 SS	10′	
T15	316 SS	15′	
T20	316 SS	20′	
T25	316 SS	25′	

4 – BULB LENGTH SELECTION		
Direct Mount		
Order Code	**“S” Dimension**	**Minimum Thermowell “U” Dimension**
027[8]	2¾″	–
040	4″	2½″
060	6″	4½″
090	9″	7½″
120	12″	10½″
Remote Mount		
030[9]	3″	2½″

5 – OPTIONS
Use table on page 7

6 – STANDARD TEMPERATURE RANGE SELECTION	
Adjustable Range	
°F	**°C**
–40 to 60	–40 to 16
0 to 100	–40 to 40
75 to 205	20 to 95
150 to 260	65 to 125
235 to 375	110 to 190
350 to 525	175 to 275
500 to 750[2]	260 to 400

NOTES:

1 Standard switch.
2 Available with remote mount thermal systems only.
3 Dual switches are 2 SPDT snap-action switches, not independently adjustable.
4 Wires cannot be terminated inside T400 switch enclosure.
5 Not available with Type 700 enclosure.
6 Estimated dc rating, 2.5A, 28 Vdc (not UL listed).
7 Estimated dc rating, 0.4A, 120 Vdc (not UL listed).
8 Not available on 350 to 525°F.
9 Consult factory on remote mount for bulb lengths other than 3″.

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B-Series Switches – Pressure, Differential Pressure, Temperature & Hydraulic

B-SERIES HYDRAULIC PRESSURE SWITCH MODEL NUMBER:

To specify the exact switch desired, select entries from appropriate tables as shown in example below.

1		2		3	4			5
H	4	2	4	V	X	F	S	3000 PSI

1 – ENCLOSURE

H4	Hydraulic pressure switch, Type 400, watertight enclosure meets NEMA 3, 4, 4X, 13 and IP66 requirements.

2 – SWITCH ELEMENT SELECTION

Order Code	Switch Elements UL/CSA Listed SPDT	
20[3]	Narrow deadband ac	15A, 125/250 Vac
21	Ammonia service	5A, 125/250 Vac
22	Hermetically sealed switch, narrow deadband	5A, 125/250 Vac
23	Heavy duty ac	22A, 125/250 Vac
24[1]	General purpose	15A, 125/250/480 Vac ½A, 125 Vdc ¼A, 250 Vdc; 6A, 30 Vdc
25	Heavy duty dc	10A, 125 Vac or dc, ⅛ HP, 125 Vac or dc
26[3]	Sealed environment proof	15A, 125/250 Vac
27	High temperature 300°F	15A, 125/250 Vac
28	Manual reset trip on increasing	15A, 125/250 Vac
29	Manual reset trip on decreasing	15A, 125/250 Vac
32	Hermetically sealed switch, general purpose	11A, 125/250 Vac 5A, 30 Vdc
42	Hermetically sealed switch, gold contacts	1A, 125 Vac
UL/CSA Listed Dual (2 SPDT)		
61[3]	Dual narrow deadband	15A, 125/250 Vac
62[3]	Dual sealed environment proof	15A, 125/250 Vac
63	Dual high temp. 300°F	15A, 125/250 Vac
64	Dual general purpose	15A, 125/250/480 Vac ½A, 125 Vdc ¼A, 250 Vdc
65	Dual ammonia service	5A, 125/250 Vac
70	Dual low level, gold contacts	1A, 125 Vac

3 – ACTUATOR SEAL

Code and Material	Process Temperature Limits °F[4]	
V – Viton	20 to 300	Viton O-Ring, Stainless Steel Pressure Connection

4 – OPTIONS

Use table from page 7

5 – STANDARD PRESSURE RANGE

Range psi	Adjustable Setpoint Limits psi	Proof Pressure psi
1000	150-1000	12,000
2000	300-2000	12,000
3000	450-3000	12,000
5000	750-5000	10,000
7500	1125-7500	100,000

NOTES:

1 Standard switch.
2 Dual switches are 2 SPDT snap-action switches, not independently adjustable.
3 Estimated dc rating, 0.4A, 120 Vdc (not UL listed).
4 Ambient operating temperature limits –20 to 150°F, all styles, setpoint shift of ±1% of range per 50°F temperature change is normal. Switches are calibrated at 70° F reference.

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B-Series Switches – Pressure, Differential Pressure, Temperature & Hydraulic

OPTIONAL FEATURES AND ACCESSORIES

B-SERIES SWITCH OPTIONS								
		Appicable Switch Series						
		Pressure		Differential Pressure		Temp-erature	H	
Code	Description	(psi)	(in. H_2O)	(psi)	(in. H_2O)	All Ranges		Notes
XBP	Wall Mounting Bracket in. H_2O		•		•			
XBX	½″ Male NPT Bushing					•		
XCH	Chained Cover	•	•	•	•	•	•	
XC8	CSA Approval	•	•	•	•	•		11
XCN	ATEX Directive 94/9/EC EEx d IIC T6	•	•	•	•	•		
XFM	FM Approval – Single Element	•	•	•	•			17
	FM Approval – Dual Element	•	•	•	•			17
XFP	Fungus Proofing	•	•	•	•	•	•	
XFS	Factory Adjusted Setpoint	•	•	•	•	•	•	2
XG3	Belleville Actuator	•						16,17
XG5	UL Limit Control to 150″ H_2O				•			1, 17
XG6	UL Limit Control to 600 psi	•						1, 17
XG7	Secondary Chamber with Vent	•						13
XG8	Steam Limit Control to 300 psi	•						7
XG9	Fire Safe Welded Actuator	•						7
XHS	High Static Differential Pressure			•				15
XHX	High Pressure, 40 psi, (static) d/p only 160 psi (proof) d/p only 100 psi (proof) pressure only (″ H_2O)		•		•			
XJK	Left Conduit Connection	•	•	•	•	•	•	9
XJL	¾″ to ½″ Reducing Bushing	•	•	•	•	•	•	
XJM	Metric Electrical Conduit Connection M20 x 1.5	•	•	•	•	•	•	
XK3	Terminal Block (700 Series only)	•	•	•	•	•		6
XLE	6 foot Leads on the Micro Switch	•	•	•	•	•	•	
XNH	Tagging Stainless Steel	•	•	•	•	•	•	
XNN	Paper Tag	•	•	•	•	•	•	
XPK	Pilot Light(s) Top Mounted	•	•	•	•	•	•	4
XPM	¾″ Sealed Conduit Connection with 16″ Lead Wires	•	•	•	•	•	•	
XTA	316 Stainless Steel Pressure Connection for in. H_2O Range		•		•			
XTM	2″ Pipe Mounting Bracket	•	•	•	•	•		
XUD	316 Stainless Steel Pressure Conn.			•				
X06	Pressure Connection: ½ NPT Male, ¼ NPT Female 316 Stainless Steel (Combination)	•	•	•	•			5
X07	½ NPTF Press. Conn., 316 SS	•	•	•	•			10
X6B	Cleaned for Oxygen Service	•	•	•				3
	Diaphragm Seal	•	•	•	•			

NOTES:

1 Buna N and Viton diaphragm.
2 Advise static or working pressure for differential pressure switches.
3 Buna N cannot be cleaned for oxygen service.
4 N/A on 700 Series.
5 Standard with 1000 and 3000 psi ranges. Bottom connection only on DP in H_2O ranges.
6 Terminal Blocks standard with 700 dual switches.
7 Stainless steel diaphragm only.
8 Pressure connection ¼ NPTF.
9 Standard on 700 Series. N/A with DPDT element on 400 Series.
10 N/A with Monel diaphragm.
11 Standard on 400 Series.
12 N/A on 3000 psi range. Available with Teflon diaphragm only.
13 SS diaphragm required. Teflon diaphragm is the backup. NEMA 7 only.
14 Available in ranges vacuum to 600 psi. Not available with stainless steel or Monel diaphragm.
15 Buna N and Viton diaphragm – 15#D & 30#D only.
16 24, 32, 64 or 68 element only.
17 N/A on all combinations.
18 700 Series only.

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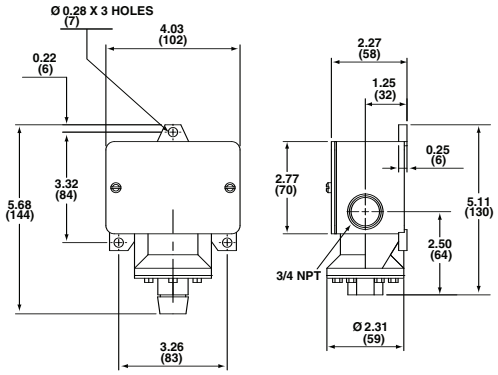
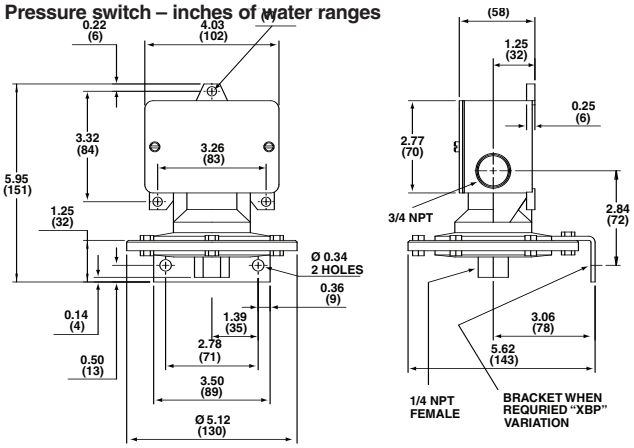
B-Series Switches – Pressure, Differential Pressure, Temperature & Hydraulic

Dimensions – 400 Series

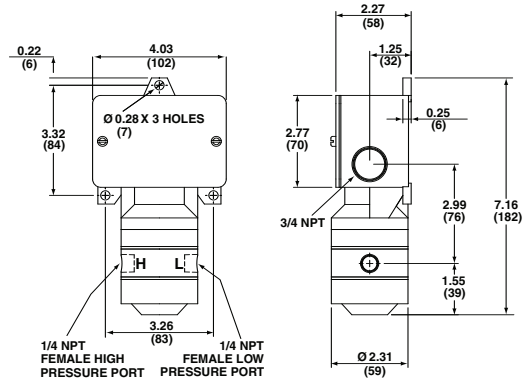
Pressure switch – psi ranges



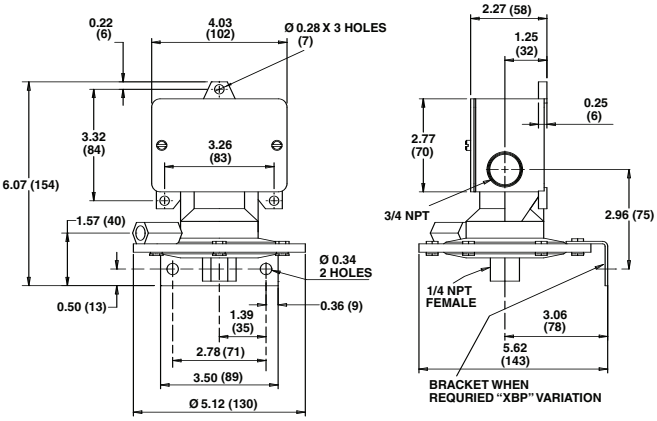
Pressure switch – inches of water ranges



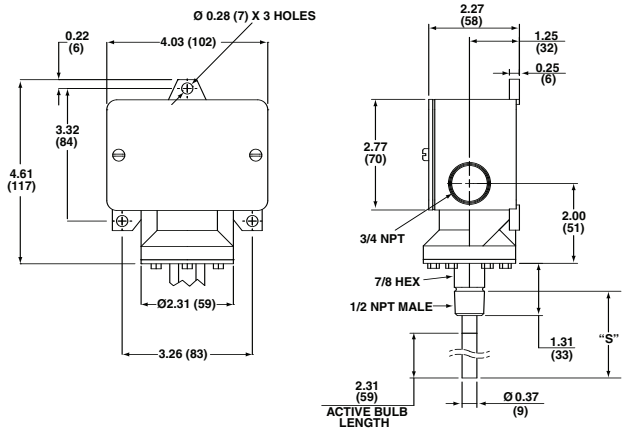
Differential pressure switch – psi differential ranges



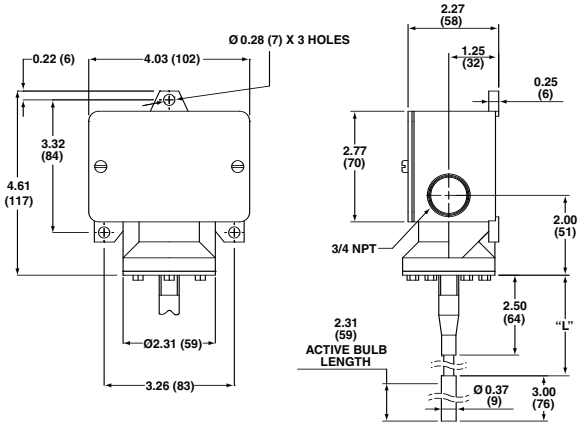
Differential pressure switch – inches of water ranges



Temperature switch – direct mount



Temperature switch – remote mount



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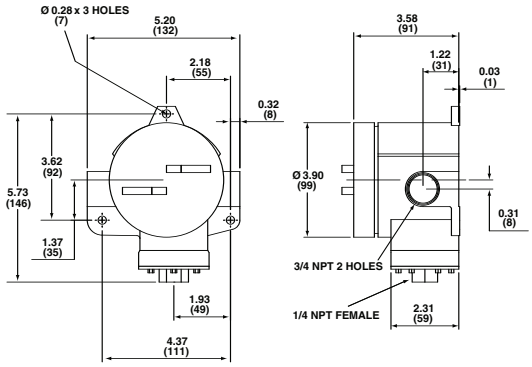
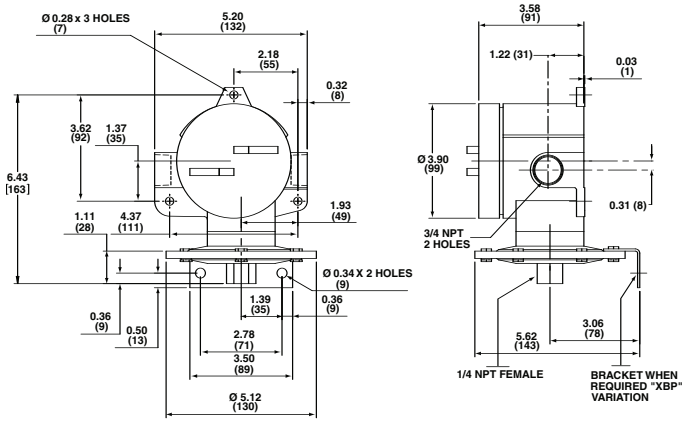
B-Series Switches – Pressure, Differential Pressure, Temperature & Hydraulic

Dimensions – 700 Series

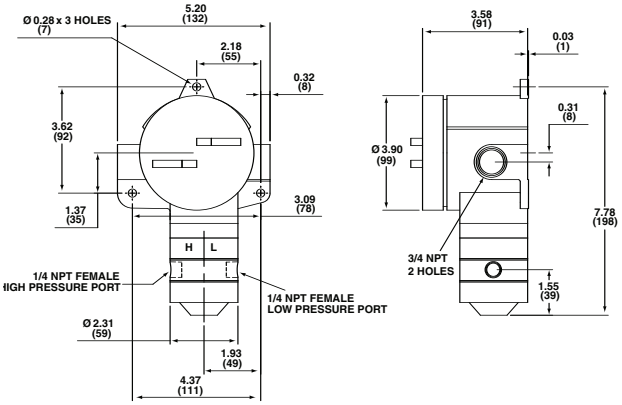
Pressure switch – psi ranges



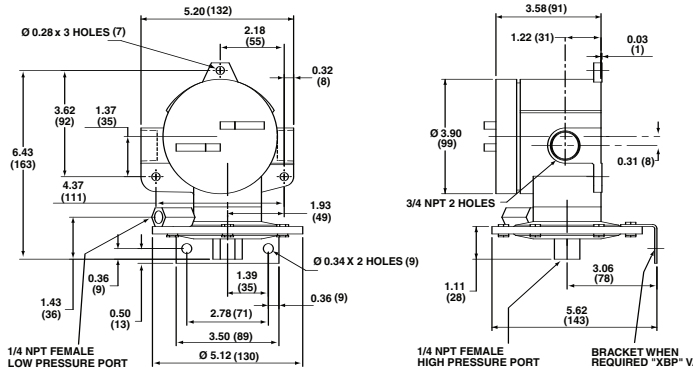
Pressure switch – inches of water ranges



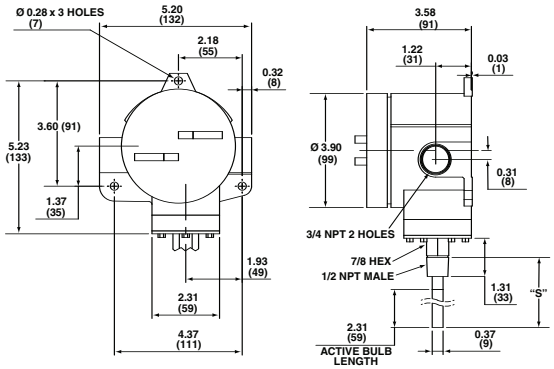
Differential pressure switch – psi differential ranges



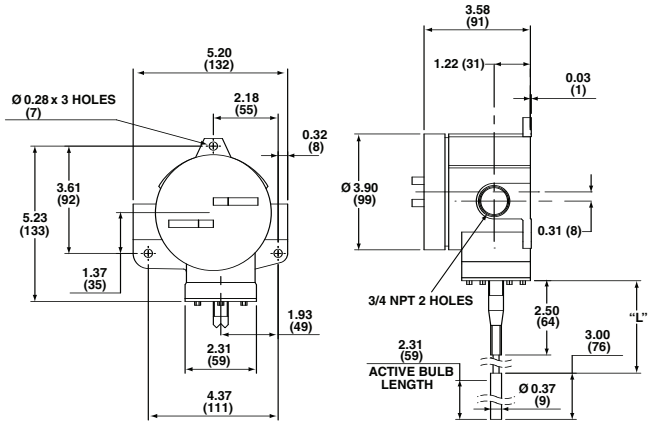
Differential pressure switch – inches of water ranges



Temperature switch – direct mount



Temperature switch – remote mount



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ASHCROFT®

Pressure and Differential Pressure Switches, Watertight Enclosure, Type 400, B-Series

This general purpose Ashcroft® switch series is ideal for use in virtually all Industrial and OEM applications.

- ***Watertight NEMA 4X enclosure, IP66***
- ***Choice of switch elements for all applications, including hermetically sealed***
- ***Wide choice of wetted materials, including all-welded Monel or stainless steel***
- ***Fixed or limited adjustable deadband***
- ***Approved for UL, CSA and FM[8] ratings***
- ***Setpoints adjustable from 15-100% of range***
- ***Choice of actuators, including designs for fire-safe and NACE applications[8]***
- ***Readily available***
- ***Standard pressure connection materials:***
  - ***Pressure psi ranges - 316L stainless steel***
  - ***Differential psid ranges - Nickel-plated brass[9]***
  - ***Pressure and differential inches of water ranges - Epoxy coated carbon steel***

IN A RUSH? ASK FOR ASHCROFT GOLD SERVICE

1 - ENCLOSURE

B4 - Pressure switch, type 400, watertight enclosure meets NEMA 3, 4, 4X and 13, IP66 requirements

D4 - Differential pressure switch, type 400, watertight enclosure meets NEMA 3, 4, 4X and 13, IP66 requirements

2 - SWITCH ELEMENTS

Order Code	Description/Maximum Electrical Ratings UL/CSA Listed SPDT	
20[4]	Narrow deadband	15A, 125/250 Vac
21[9]	Ammonia service	5A, 125/250 Vac
22[3]	Hermetically sealed switch, narrow deadband	5A, 125/250 Vac
23	Heavy duty ac	20A,125/250 Vac
24[1]	General purpose	15A,125/250/480 Vac 1/2A, 125 Vdc 1/4A, 250 Vdc
25	Heavy duty dc	10A,125/ Vac or dc 1/8HP 125/ Vac or dc
26[4]	Sealed environment proof	15A, 125/250 Vac
27	High temp. 300°F	15A, 125/250 Vac
28	Manual reset trip on increasing	15A, 125/250 Vac
29	Manual reset trip on decreasing	15A, 125/250 Vac
31	Low level (gold) contacts	1A,125/250 Vac
32	Hermetically sealed switch, general purpose	11A, 125/250 Vac 5A, 30 Vdc
50	Variable deadband	15A,125/250 Vac
UL/CSA Listed Dual SPDT[2]		
61[4]	Dual narrow deadband	15A, 125/250 Vac
62[4]	Dual narrow environment proof	15A, 125/250 Vac
63	Dual high temp. 300°F	15A, 125/250 Vac
64	Dual general purpose	15A, 125/250/480 Vac 1/2A, 125 Vdc 1/4A, 250 Vdc
65	Dual ammonia service	5A, 125/250/480

3 - ACTUATOR SEAL[7]

Code & Material	Process Temp.[6] Limits °F	Range			
		Vac in.H_2O	0-600 psi	1000 psi	2000-3000 psi
B-Buna N	0 to 150	●	●	●	●
V-Viton	20 to 300	●	●	●	
T-Teflon	0 to 150	●	●	●	●
S-SS[5][10]	0 to 300		●	●	
P-Monel[5][10]	0 to 300		●	●	

4 - OPTIONS

(See pages 238-239)

5 - STANDARD PRESSURE RANGES

(See page 235)

NOTES:

1. Standard switch.
2. Dual switches are 2 SPDT snap-action switches not independently adjustable.
3. Estimated dc rating, 2.5A, 28 Vdc (not UL listed).
4. Estimated dc rating, .4A, 120 Vdc (not UL listed).
5. Available on pressure only.
6. Ambient operating temperature limits –20 to 150°F, all styles. Setpoint shift of ±1% of range per 50°F is normal. Switch calibrated at 70°F reference.
7. Items are wetted by process fluid.
8. Refer to Option Table.
9. Order Option XUD, stainless steel process connection.
10. On differential switches, stainless steel is available in 15, 30, 60 and 90 psid ranges only. Includes Teflon O-ring and 316 SS connection.

HERMETICALLY SEALED SWITCH

We recommend hermetically sealed switch elements for improved reliability. The hermetically sealed switch provides uncompromising contact protection in harsh or corrosive environments. The Ashcroft 400 Series is also approved for installation in Division II hazardous areas when supplied with hermetically sealed contacts.

Features:
- UL-recognized component, guide WSQ2, File E85076
- All-stainless steel welded construction

TO ORDER THIS B-SERIES PRESSURE SWITCH:

Select: B4 20 B XPK 600#

1. Enclosure: B4
2. Switch Element: 20
3. Actuator Seal: B
4. Options (See pages 238-239): XPK
5. Pressure Range (See page 235): 600#

Consult factory for guidance in product selection
Phone (203) 385-0217, Fax (203) 385-0602 or
visit our web site at www.ashcroft.com

WEKSLER

Low Pressure Gauges – Bellows Type ±2-1-2% Accuracy

STANDARD FEATURES

Movement: Bronze
Pointer: Balanced Slotted adjustable
Dial: White enameled aluminum. Black graduations and numerals
Thread Size: 1/4 male NPT; 1/2 male NPT
Connection Location: Lower or Rear (back)
Case: Style "2" polypropylene safety suitable for direct or surface mounting.

Ideal for applications under 15 psi.

RANGES FOR BELLOWS GAUGES

CODE NO.	DIAL RANGES	FIGURE INTERVALS	SMALLEST GRADUATION	BL1	BL4
				DIAL ARC	
PA	0 to 5 psi	1 psi	1/16 psi	270°	270°
PB	0 to 10 psi	1 psi	1/8 psi	270°	270°
WR	10 to 0˝ Water Vac.	2˝	1/4˝	90°	–
WS	15 to 0˝ Water Vac.	3˝	1/2˝	90°	–
WT	40 to 0˝ Water Vac. & 75 mm Hg.	5˝ & 10 mm	1˝ & 1 mm	270°	180°
VD	5 to 10˝ Hg. Vac.	1˝	1/10˝	270°	270°
VA	10 to 0˝ Hg. Vac.	2˝	1/4˝	270°	270°
WW	10˝ Water Vacuum & 10˝ Water Pressure	2˝	1/2˝	180°	180°
WX	20˝ Water Vacuum & 40˝ Water Pressure	10˝	1˝	270°	270°
WY	10˝ Hg. Vacuum & 5 psi Pressure	2˝ & 1 psi	1/5˝ & .1 psi	270°	270°
WA	0 to 10˝ Water Press.	1˝	1/4˝	90°	–
WB	0 to 15˝ Water Press.	3˝	1/4˝	90°	90°
WH	0 to 20˝ Water Press.& 12oz.	1/2˝ & 1 oz.	1˝ & 1/4 oz.	180°	90°
WI	0 to 30˝ Water Press. & 18oz.	5˝ & 1 oz.	1/2˝ & 1/2 oz.	215°	–
WI	0 to 30˝ Water Press. & 18oz.	10˝ & 1 oz.	1˝ & 1/2 oz.	–	180°
WJ	0 to 40˝ Water Press. & 24 oz.	5˝ & 3 oz.	1˝ & 1/2 oz.	270°	180°
WK	0 to 60˝ Water Press. & 35 oz.	10˝ & 5 oz.	1˝ & 1 oz.	270°	270°
WL	0 to 80˝ Water Press. & 45 oz.	10˝ & 5 oz.	1˝ & 1 oz.	270°	270°
WM	0 to 100˝ Water Press. & 57 oz.	10˝ & 5 oz.	1˝ & 1 oz.	270°	270°

NOTES:
1. Regal Low Pressure Gauges are calibrated in accordance with ASME B40.1 Grade A (±1% middle third). See page 5 of this catalog for further reference to ASME B40.1.

BELLOWS AND SOCKET

CATALOG NO.	BELLOWS & SOCKET MATERIAL	DIAL SIZE	GAUGE TYPE	OPTIONAL CASE STYLE	
				LOWER CONNECT	BACK CONNECT
BL14	Phsp. Brnz. Bellows Brass Socket	4½˝	Low Pressure	#4 Aluminum Safety	#6 Aluminum Safety
BL44	316 SS Bellows 316 SS Socket				

HOW TO ORDER

B L 4 4 2 W K 4 L W ( )

1. Basic 4-digit Catalog No. From Table Above
2. Case Style Code From Table Above
3. Range Code From Range Tables Above
4. Thread Size: 4 = 1/4 Npt Male; 2 = 1/2 Npt Male
5. Connection Location: L = Lower (Bottom); or R = Rear (Back)
6. Dial Color: W = White (Standard), B = Black (Optional)
7. If Any Gauge Options Are Desired – Specify Option Code(s) From Page 37

D-7
Temperature Switch and Temperature Gauge

ASHCROFT®

Temperature Switches Watertight Enclosure, Type 400, B-Series

This broad Ashcroft® switch series is easy to use and readily retrofits to virtually all process, industrial and OEM applications.

- ***Watertight NEMA 4X, IP66 enclosure***
- ***Choice of switch elements for all applications, including hermetically sealed (NEMA 4 meets Class I, Div. 2, Groups A, B, C, & D with hermetically sealed switch)***
- ***UL, CSA listings standard***
- ***Setpoints adjustable from 15-100% of range***
- ***Wetted material is all-welded stainless steel***
- ***Fixed or limited adjustable deadband***
- ***Readily available***

CE
LOOK FOR THIS AGENCY MARK ON OUR PRODUCTS

IN A RUSH? ASK FOR ASHCROFT GOLD SERVICE

1 - ENCLOSURE

T4 - Temperature switch, type 400, watertight enclosure meets NEMA 3, 4, 4X and 13, IP66 requirements

2 - SWITCH ELEMENTS

Order Code	Description/Maximum Electrical Ratings UL/CSA Listed SPDT	
20[4]	Narrow deadband	15A, 125/250 Vac
21	Ammonia service	5A, 125/250 Vac
22[3]	Hermetically sealed switch, narrow deadband	5A, 125/250 Vac
23	Heavy duty ac	20A,125/250 Vac
24[1]	General purpose	15A,125/250/480 Vac 1/2A, 125 Vdc 1/4A, 250 Vdc
25	Heavy duty dc	10A,125/ Vac or dc 1/8HP 125/ Vac or dc
26[4]	Sealed environment proof	15A, 125/250 Vac
27	High temp. 300°F	15A, 125/250 Vac
28	Manual reset trip on increasing	15A, 125/250 Vac
29	Manual reset trip on decreasing	15A, 125/250 Vac
31	Low level (gold) contacts	1A,125/250 Vac
32	Hermetically sealed switch, general purpose	11A, 125/250 Vac 5A, 30 Vdc
50	Variable deadband	15A,125/250 Vac
	UL/CSA Listed Dual SPDT[2]	
61[4]	Dual narrow deadband	15A, 125/250 Vac
62[4]	Dual narrow environment proof	15A, 125/250 Vac
63	Dual high temp. 300°F	15A, 125/250 Vac
64	Dual general purpose	15A, 125/250/480 Vac 1/2A, 125 Vdc 1/4A, 250 Vdc
65	Dual ammonia service	5A, 125/250/480

3 - THERMAL SYSTEM SELECTION[5]

DIRECT MOUNT

Order Code	System Material	Style
TS	316 stainless steel	Rigid

REMOTE MOUNT

Order Code	System Material	Line Length	Style
T05	316 stainless steel	5′	Capillary with 302 SS Spring Armor
T10	316 stainless steel	10′	
T15	316 stainless steel	15′	
T20	316 stainless steel	20′	
T25	316 stainless steel	25′	

4 - BULB LENGTH SELECTION[6]

DIRECT MOUNT

Order Code	"S" Dimension	Minimum Thermowell "U" Dimension
027	2¾″	—
040	4″	2½″
060	6″	4½″
090	9″	7½″
120	12″	10½″
	REMOTE MOUNT	
030	3″	2½″

5 - OPTIONS

See pages 238-239

6 - STANDARD TEMPERTATURE RANGES

See page 235

NOTES:

1. Standard switch.
2. Dual switches are 2 SPDT snap-action switches not independently adjustable.
3. Estimated dc rating, 2.5A, 28 Vdc (not UL listed).
4. Estimated dc rating, 0.4A, 120 Vdc (not UL listed).
5. Additional line lengths available, call factory.
6. Additional bulb lengths available, call factory.

Switches calibrated at 70°F ambient reference.

HERMETICALLY SEALED SWITCH

We recommend hermetically sealed switch elements for improved reliability. The hermetically sealed switch provides uncompromising contact protection in harsh or corrosive environments. The Ashcroft 400 Series is also approved for installation in Division II hazardous areas when supplied with hermetically sealed contacts.

Features:
- UL-recognized component, guide WSQ2, File E85076
- All-stainless steel welded construction

TO ORDER THIS B-SERIES TEMPERATURE SWITCH:

Select: **T4** **20** **T05** **030** **XNH** **150° to 260°F**

1. Enclosure: T4
2. Switch Element: 20
3. Thermal System: T05
4. Bulb Length: 030
5. Options (see pages 238-239): XNH
6. Temperature Range (see page 235): 150° to 260°F

Consult factory for guidance in product selection
Phone (203) 385-0217, Fax (203) 385-0602 or
visit our web site at www.ashcroft.com

ASHCROFT®

Duratemp® Thermometer
Series 600A-01
Accuracy (±1% F.S.)

- ***Exclusive movementless design resists shock and vibration – no gears to wear or misalign resulting in increased instrument life***
- ***Gas-operated molecular sieve***
- ***No elevation error***
- ***Mercury free***
- ***One bulb size for all ranges***
- ***±1% full-span accuracy***
- ***Maxivision® dial***
- ***Readily available – two to three weeks delivery***
- ***Limited five-year warranty***

A high impact-resistant polished stainless steel case. Bayonet ring facilitates easy removal for glass replacement and pointer adjustment. A versatile case that enables surface or flush mounting. Available in 4½″ dial size.

SELECTION TABLE

600A — 01 — C01 — B01 — A1 — L07 — AK

600A

Table 1

CASE STYLE	
CODE	DESCRIPTION
01	ST. ST. BAYONET RING

Table 2

CASE SIZE		MOUNTING			
		MOUNTING		CONNECTION	
CODE	SIZE	SURFACE	FLUSH	LOWER	REAR
C01	4½	✓		✓	
C11	4½		✓		✓

Table 3

BULB STYLES*	
CODE	DESCRIPTION
B01	12″ Bendable extension with ½ NPT union connection
B03	Plain bulb with rigid extension, no union
B08	Plain bulb with rigid extension, ½ NPT union on armor
B17	18″ Bendable extension with ½ NPT union connection
B18	24″ Bendable extension with ½ NPT union connection

*Minimum recommended insertion length ("u" dimension) in liquids is 4 inches and in gases is 6 inches for standard ⅜ x 3″ bulb

Table 4

ARMOR STYLE	
CODE	DESCRIPTION
A1	Stainless Steel Spring

Table 5

LINE LENGTH	
CODE	LINE LENGTH
L01	5′
L03	10′
L07	20′
L09	30′
L13	50′
L19	80′

Table 6

RANGES	
CODE	SINGLE RANGES
AB	–320/200°F
AE	–100/100°F
AG	–40/180°F
AK	20/240°F
AL	50/300°F
AN	50/550°F
AR	50/750°F
AT	400/1200°F
AY	–200/100°C
BL	–80/40°C
BN	–40/80°C
BS	0/120°C
BT	10/150°C
BU	0/300°C
BW	0/400°C
BJ	200/650°C
	DUAL RANGES
CE	20/240°F
	0/120°C
CF	50/550°F
	0/300°C
DR	50/300°F
	10/150°C
DT	–40/180°F
	–40/80°C

TO ORDER THIS DURATEMP 600A-01 THERMOMETER:

Select:

		600A	01	C01	B01	A1	L07	AK	XNH
1. Case Style: Stainless Steel/Bayonet Ring	Table 1								
2. Case Size & Mounting: 4½″ Surface, Lower	Table 2								
3. Bulb Style: 12″ Bendable Extension with Union Connection	Table 3								
4. Armor Style: Stainless Steel Spring	Table 4								
5. Line Length: 20 feet	Table 5								
6. Temperature Range: 20/240°F	Table 6								
7. Options: Stainless Steel Tag	(See Page 210)								

Consult factory for guidance in product selection
Phone (203) 385-0217, Fax (203) 385-0602 or
visit our web site at www.ashcroft.com

MADE IN U.S.A.

D-8
Level Switch

Large Size – Alloys

LS-1800 and LS-1900 Series are a Step Above Our Plastic Units for Pressure Capabilities

Excellent stability for general use in oils and water.

LS-1800 Series – Buna N Float

Intermediate in size, LS-1800 switches provide long life and dependability to meet a broad range of requirements.

LS-1800 Series – Teflon® Float

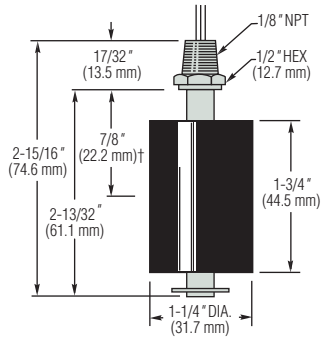
LS-1900 Series – Buna N Float

With large float displacement, switch withstands rough service; is suitable for high viscosity liquids.

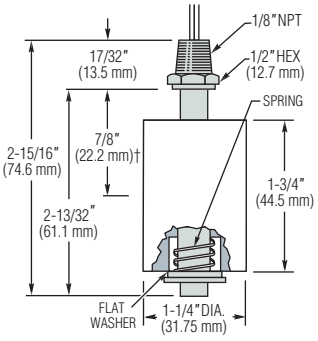
Dimensions

LS-1800 Series

Buna N Float

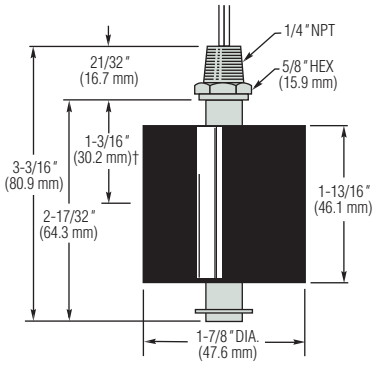


Teflon® Float



LS-1900 Series

Buna N Float



†L_1 = Switch actuation level, nominal (based on a liquid specific gravity of 1.0).

Common Specifications

Electrical Termination: No.18 AWG, 24˝L., Polymeric Lead Wires.

Approvals: All Switches on this page are U.L. Recognized – File No. E45168, and are CSA Listed – File No. 30200.

Switch Operation: Selectable, N.O. or N.C., by inverting float on unit stem (except for LS-1800 Series switch with Teflon® float). Units are shipped N.O. unless otherwise specified.

How To Order – Select Part Number based on specifications required.

	Material							
Series Number	Stem and Mounting	Float	Other Wetted	Min. Liquid Sp. Gr.	Operating Temperature	Pressure, PSI, Max.	Switch* SPST	Part Number
LS-1800	Brass	Buna N	316 Stainless Steel, Hysol	.75	Water: to 180°F (82°C) Oil: -40°F to +230°F (-40°C to +110°C)	150	20 VA	**01801**
							100 VA**	**35651**
	316 Stainless Steel	Buna N		.75			20 VA	**01807**
							100 VA**	**35657**
		Teflon®		.65	-40°F to +250°F (-40°C to +121°C)	300	20 VA, N.O.	**01811**
LS-1900	Brass	Buna N	316 Stainless Steel, Hysol	.55	Water: to 180°F (82°C) Oil: -40°F to +230°F (-40°C to +110°C)	150	20 VA	**01901**
							100 VA***	**35676**
	316 Stainless Steel			.55			20 VA	**01907**
							100 VA	**35682**

*See "Electrical Data" on Page X-5 for more information.

**LS-1800 100 VA switches are not U.L. Recognized.

*** LS-1900 100VA unit is UL Resistive Rated.

Electrical Data

Standard reed switches in GEMS level switch units are hermetically-sealed, magnetically actuated, make-and-break type. Switches are SPST or SPDT and are rated in Volt-Amps (VA).

See the chart below for maximum load characteristics of GEMS level switches. CAUTION: Contact protection is required for transient or high in-rush current. Refer to GEMS Bulletin #133702 or call your GEMS representative.

VA	Volts	Amps AC	Amps DC
10 General Use	0-50	.2	.13
	120	.08	N.A.
	100	N.A.	.10
20 Pilot Duty	0-30	.4	.3
	120	.17	.13
	240	.08	.06
50 General Use	0-50	0.5	0.5
	120	.4	.4
	240	.2	.2
100*	120	.8**	N.A.
	240	.4	N.A.

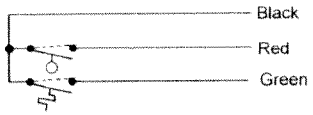
* Not U.L. Recognized ** Limited to 50,000 operations

Typical Wiring Diagrams

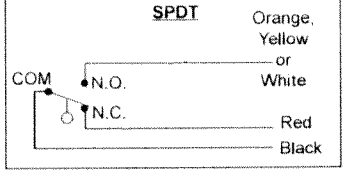
(Circuit Condition Dry)

SPST, Normally Open or Closed

SPST, With Thermostat Option=



SPDT



= Thermostat switches open or close when ambient temperature reaches specified setpoint. Thermostat units not CE approved.

European Pressure Directive Addendum

The product is designed and manufactured in accordance with Sound Engineering Practice as defined by the Pressure Equipment Directive 97/23/EC. This product must not be used as a "safety accessory" as defined by the Pressure Equipment Directive, Article 1, Paragraph 2.1.3. The presence of a CE Mark on the unit does not relate to the Pressure Equipment Directive.

CE This product is suitable for Class I and Class II applications only, per the requirements of standard EN60730 and any additional specific requirements for a particular application or medium being sensed. Class I compliance of metal bodied units requires a ground connection between the metal body and the earthing system of the installation. Class I compliance of plastic bodied units in contact with a conductive medium requires that the medium be effectively earthed so as to provide an earthed barrier between the unit and accessible areas. For Class III compliance, a supply at safety extra-low voltage (SELV) must be provided. Please consult the Factory for compliance information on specific part numbers.

Important Points!

Product must be maintained and installed in strict accordance with the National Electrical Code and GEMS product catalog and instruction bulletin. Failure to observe this warning could result in serious injuries or damages.

An appropriate explosion-proof enclosure or intrinsically safe interface device must be used for hazardous area applications involving such things as (but not limited to) ignitable mixtures, combustible dust and flammable materials.

*** Warning: To prevent ignition of flammable or combustible atmospheres, disconnect power before servicing.

Pressure and temperature limitations shown on individual catalog pages and drawings for the specified level switches must not be exceeded. These pressures and temperatures take into consideration possible system surge pressures/temperatures and their frequencies.

Selection of materials for compatibility with the media is critical to the life and operation of GEMS level switches. Take care in the proper selection of materials of construction, particularly wetted materials.

Life expectancy of switch contacts varies with applications. Contact GEMS if life cycle testing is required.

Ambient temperature changes do affect switch set points, since the specific gravity of a liquid can vary with temperature.

Level switches have been designed to resist shock and vibration; however, shock and vibration should be minimized.

Liquid media containing particulate and/or debris should be filtered to ensure proper operation of GEMS products.

Electrical entries and mounting points may require liquid/vapor sealing if located in an enclosed tank.

Level switches must not be field repaired.

Physical damaged sustained by the product may render it unserviceable.

P/N 72947
Rev. Y

Gems Sensors

Gems Sensors Inc.
One Cowles Road
Plainville, CT
06062.1198

tel 860.747.3000
fax 860.747.4244

Single-Station Level Switches

Instruction Bulletin No. 72947

Series	Mounting	HEX Size	Float Diameter
LS-1700**	1/8" NPT	1/2"	1" (Slosh Shield Version 1-13/32")
LS-1700TFE*	1/8" NPT	1/2"	1-1/8"
LS-1750**	1/8" NPT	1/2"	1-1/2" (Slosh Shield Version 1-13/16")
LS-1755**	1/8" NPT	1/2"	1-1/32"
LS-1800**	1/8" NPT	1/2"	1-1/4"
LS-1850**	1/2" NPT	3/4" Wrench Flat	3-1/2"
LS-1900**	1/4" NPT	5/8"	1-7/8"
LS-1900TFE*	1/4" NPT	21/32"	2-1/8"
LS-1950**	1/4" NPT	5/8"	2-1/16"
LS-19735*	1/4" NPT	5/8"	1-1/2"
LS-3*	1/8" NPT	1/2"	1"
	3/8" - 16 Str. Thd.	1/2"	1"
	1/8" NPT	1/2"	1-1/4" (Slosh Shield Version)
	1/8" NPT	1/2"	1-7/8" (P/N 76707)
	1/8" NPT	1/2"	3/4" (P/N 201540)
LS-30*	1/4" NPT	5/8"	1-7/8"
LS-38760**	1/4" NPT	9/16" Wrench Flat	1-7/8"
LS-74780*	1/4" NPT	5/8"	1-1/2"
LS-77700**	1/8" NPT	1/2"	1"
	3/8" - 24 Str. Thd.	3/4"	1-1/2"
TH 800-A*** Level Temp	1/4" NPT	5/8"	1-1/4"

*** Plastics** **** Alloys**

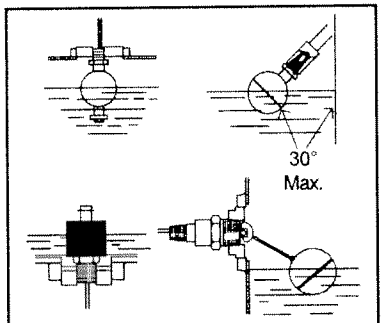
*** **Specialty Switches: Please use caution when handling these units, as shock may damage the thermostat temperature setting. Thermostat units not CE approved.**

Installation

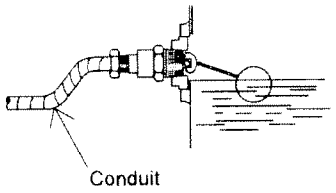
A standard NPT female boss in tank top, bottom or side is all that is required. Units operate in any attitude - from the vertical to a 30° inclination - with lead wires up or down. Standard IPS pipe extends units to any intermediate level in the tank. ***(Figure 1)***

Moisture Protection: When moisture exists in conduit and extension pipes, the potential for this moisture to "wick" down the wire leads and into the switch assembly exists. Should this happen, the switch will appear to be closed due to a high resistance path through the moisture. The following suggestions may help to prevent this from happening:

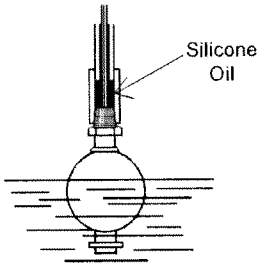
1. Pitch conduit away from the level switch when possible, so that condensation will drip away from the level switch assembly. ***(Figure 2)***
2. When a vertical run of extension pipe is used to extend a level switch down from the top of the tank, a non-conductive silicone oil should be used to fill the vertical run. Alternatively, an appropriate potting may be used to fill the vertical run to occupy the space in which condensation will normally form. ***(Figure 3)***



- Figure 1 -



- Figure 2 -



- Figure 3 -

CAUTION

Most of GEMS level products incorporate a potting cap or are fully potted. Due to the bonding characteristics of the potting to the wire leads, there is no way of assuring a water-tight seal at the potting joint. Our potting cap will resist moisture to some degree, but the precautions mentioned above should be used to assure moisture doesn't enter the switch and cause a short.

Consult your GEMS representative for more suggestions on how to lessen the effects of moisture.

Thread Treatment

1. Sealing: When threading metal threads into a metal coupling, pipe sealant or Teflon® tape is recommended. Due to potential compatibility problems, when sealing plastic threaded units, a compatible pipe sealant such as **No More Leaks**™ from Permatex® is recommended.
2. Tightening: When threading a plastic level switch into a metal coupling, the installer should use a suitable wrench and tighten the threads one to one and one-half additional turns past hand-tight. Over-torquing of the threads will result in damage to the plastic mounting plug.

No More Leaks is a trademark of Permatex® Industrial Corp., a subsidiary of Loctite Corporation. ***Teflon*** is a registered trademark of DuPont Corporation

3. The Effect of Thread Engagement on Actuation Points

The length of mounting threads engaged at installation is important in calculating switch actuation points and the actual length of stem extending into the tank. Use **the chart below** to find the thread engagement length (T) for a given NPT size. Factor the dimension into any calculation of switch actuation levels (L) and overall length (L_0).

NPT	1/8"	1/4"	1/2"	3/4"	1"	1-1/4"	2"	3"
T Dim.	.27"	.39"	.53"	.55"	.68"	.71"	.76"	1.20"

- See Examples Below -

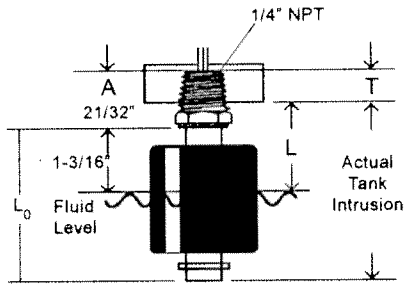
Definition of Variables Used in Examples Below

A = Mounting Length
T = Thread Engagement
P = Distance from coupling (bung) top to inside surface of tank or bracket
L_0 = Overall length from bottom of mounting
L = Switch actuation level as measured from inside surface of tank or bracket to fluid surface
L_1 = Switch actuation level, nominal, as measured from bottom of mounting (based on a liquid specific gravity of 1.0)

Internally Mounted LS-1900
(Standard Length)

LS-1900 Series internally mounted through a 1/4" NPT hole. To calculate "L" dimension:

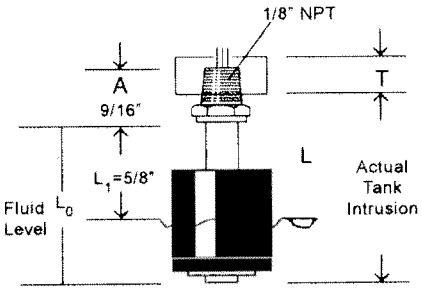
$L = L_1 + (A-T)$
$L = 1\text{-}3/16" + (21/32" - .39")$
$L = 1.46"$



Internally Mounted LS-1700/1750
(Standard Length)

LS-1700/1750 internally mounted through a 1/8" NPT hole. To calculate "L" dimension:

$L = L_1 + (A-T)$
$L = .63" + (.56" - .27")$
$L = .92"$



D-9
Differential Pressure Gauge

ASHCROFT®

Differential Pressure Gauges
Type 1133
±2% Ascending Accuracy

- ***Large convoluted diaphragm actuator***
- ***Stainless steel case***
- ***Ranges from 1 IWD-25 IWD***
- ***Static pressures up to 500 psi***
- ***Aluminum(3), stainless steel bodies(3)***
- ***Buna-N seals (others available)***
- ***Superior magnets for smoother power motion***
- ***Standard switches available***
- ***5-year warranty***

The Type 1133 uses a convoluted-diaphragm to sense low inches of water differentials while ensuring no migration of the process media. Maximum static pressures for ranges of 5 IWD and below is 45 psi and 500 psi for all other ranges. Body materials are only available in Aluminum, with Buna, Viton or EPDM seals.(2)

(1) Not for use with incompatible media.
(2) Other wetted parts include stainless steel, Teflon and ceramic.
(3) Not to be used with water or corrosive applications.

SPECIFICATIONS	Type 1133
Accuracy (Ascending)	±2%
Migration	Zero
Range Limits	0-1 IWD to 25 IWD
Maximum Static Pressure	500 psi (all)
Actuator	Convoluted Diaphragm
Case Material	Stainless Steel
Dial Size	3½˝ (35), 4˝ (40), 4½˝ (45), 6˝ (60)
Maximum Process Temperature	175°F / 80°C
Body Materials	Aluminum (F), Stainless Steel (S)
Diaphragm	Buna-N
Connection Size (Female)	¼ NPT (25)
Connection Location	In-Line (S), Lower (L), Back (B)
Window	Glass
Warranty	Five Years
OPTIONS	
Switches(1,2) NEMA-4	Available
Front Flange (XFF)	Available
Viton/Diaphragm (XVD)	Available
EPDM/Diaphragm (XEM)	Available
Glycerin Fill (L)	N/A
Silicone Fill (XGV)	N/A
Plastic Window (XPD)	Available
Explosion Proof (XEK)	N/A

(1) Applicable to Switches
(XV1) 1 SPST with DIN Plug
(XV2) 1 SPST with Terminal Strip
(XV3) 2 SPST with DIN Plug
(XV4) 2 SPST with Terminal Strip
(XV5) 1 SPDT with DIN Plug
(XV6) 1 SPDT with Terminal Strip
(XV7) 2 SPDT with DIN Plug
(XV8) 2 SPDT with Terminal Strip

(2) Ajustable from 40-100% of range

RATINGS FOR STANDARD SWITCHES:

SPST SWITCH

Specifications:
Contact Rating
10 VA ac (rms) or dc (max)
Switching Current
0.5 Amp ac (rms) or dc (max)
Switch Voltage
150 Vac/Vdc (max)

SPDT SWITCH

Specifications:
Contact Rating
5 VA ac (rms) or dc (max)
Switching Current
0.25 Amp ac (rms) or dc (max)
Switch Voltage
175 Vac/Vdc (max)

STANDARD RANGES – Type 1133

in.H_2O	0-1	0-2	0-5	0-10	0-25
mmH_2O	0-25	0-50	0-125	0-250	0-600

TO ORDER THIS 1133 DIFFERENTIAL PRESSURE GAUGES:

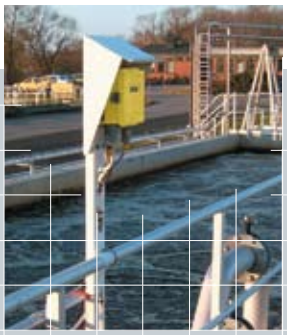
Select:	35	1133	FD	25S	XXX	10IWD
1. Dial size–3½˝, 4˝, 4½˝, 6˝						
2. Case type–1133						
3. Body material						
4. Connection size–⅛ NPTF (RQ), ¼ NPTF (25)						
5. Connection location–In-line (S), Lower (L), Back (B)						
6. Optional features–see above						
7. Standard pressure range						

Consult factory for guidance in product selection
Phone (203) 385-0217, Fax (203) 385-0602 or
visit our web site at www.ashcroft.com

D-10
Flowmeter

FCI ST98 Series Thermal Mass Flow Meters

Gas Flow Measurement Solutions for Process and Plant Applications



FCI ST98 SERIES

- Chemical
- Wastewater Treatment, Landfills
- Refineries
- Oil & Gas
- Mining
- Metals
- Manufacturing
- Cement, Stone, Brick, Glass
- Power Utilities
- Pulp & Paper
- Food & Beverage
- And more...

FCI® FLUID COMPONENTS INTERNATIONAL LLC

ST98 Series Features

- **Air and Gas Direct Mass Flow Measuring**
- **Flow Rate, Total Flow, and Temperature Display**
- **No Moving Parts, Lowest Maintenance**
- **Line Sizes 1″ to 42″ [25 to 1066 mm]**
- **Precision Calibrated**
- **Fluid Temperatures to 850 °F [454 °C]**
- **Rugged, All-Metal Agency-Certified Enclosures**
- **Integral and Remote Electronics Versions**
- **Comprehensive Approvals for Hazardous Locations**
- **RS232C, HART® and PROFIBUS® Communications**
- **110 Year MTBF**

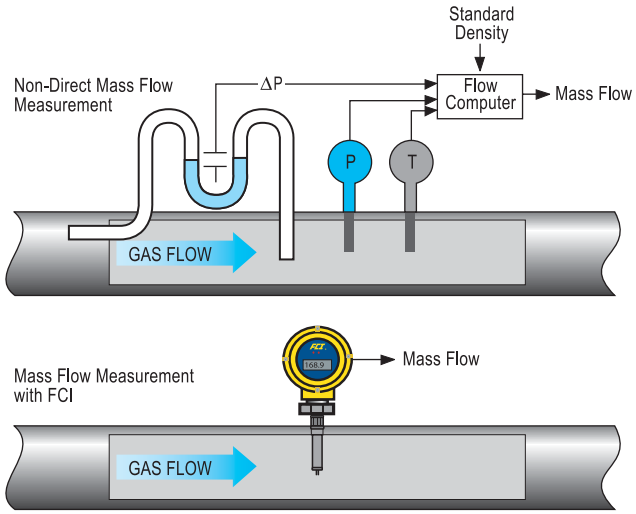
Model ST98 is an insertion flow meter for pipe sizes from 2 1/2″ to 42″ [64 to 1066 mm]. Typical calibration range is from 0.75 to 600 SFPS [0.21 to 172 NMPS].[1]

Model ST98L is an in-line flow meter for use in line sizes 1″, 1 1/2″ and 2″ [DN25, DN40, and DN50]. Typical calibration range is from 0.006 SCFM to 1850 SCFM [0.01 NCMH to 3140 NCMH].[1]

The ST98 Air / Gas Mass Flow Meter Solution

ST98 flow meters combine proprietary equal mass thermal dispersion flow sensing elements, precision electronics, and exacting fluid calibrations, all packaged within rugged, industrial enclosures. The ST98 Series delivers a superior air/gas flow measurement solution that continuously meets performance specifications in the most demanding process and plant applications with virtually no scheduled maintenance.

ST98 flow meters feature FCI's patented no-moving parts flow element design that provides direct mass flow measurement with just a single process penetration. This saves you space and eliminates unnecessary installation, expense, and performance degradation associated with separate temperature and pressure sensors, and density calculation devices needed with inferred mass flow techniques. With no moving parts to plug or foul, ST98's deliver extensive cost savings over alternative high maintenance technologies. The result is an accurate and highly repeatable mass flow measurement at the lowest total installed cost. In today's complex process control schemes, the ST98 Series provides accurate gas flow measurements essential for process consistency, quality and safe plant operation.



FCI's ST98 Series features an accuracy of ±1% of reading, 0.5% of full scale and repeatability of ±0.5% of reading. The turndown ratio is factory preset to your application from a minimum of 10:1 to a maximum of 100:1 and is field adjustable within the calibrated range. ST98 flow meters are offered in a wide range of packaging options, mounting and installation options that ensure configuration matched to your exact application conditions. From compressed air to hydrocarbon gases, single gases to bio-gas mixtures, ST98 flow meters are at work improving processes throughout the world.

[1] *At standard conditions of 70 °F and 14.7 psia [0 °C and 1.013,25 mBara for metric normal conditions]. Actual calibration range depends on actual fluid and conditions.*

Sensors Optimized to Meet the Application

To match your flow application conditions, the ST98 and ST98L are both offered in a choice of two element designs. ST98 choices are –FP and –S. ST98L choices are –F and –S.

Select the –FP and –F style element for applications in dry, clean air/gases with fluid temperatures up to 850 °F [454 °C]. The –FP and –F designs incorporate FCI's exclusive equal mass sensor in smaller diameter thermo-wells for faster response time and improved repeatability in processes with dynamic temperature swings. The –FP also features a protective shroud.

Select the –S style element when your application involves dirty or erosive fluids, high moisture content gas or a pulsating flow. The –S element features more robust, thicker wall thermo-wells and an un-shrouded equal mass sensor element that provides a noise-filtered response, extended erosion resistance, and easier cleaning. In wet/dirty gas applications such as digester, landfill, bio-gases, wet compressed air, or with erosive particulates in the gas, the –S sensor element is often the optimal choice.

ST98 and ST98L models feature an all-welded element to ensure maximum strength, durability and leak proofing. Elements are available in 316L stainless steel or, for applications in highly corrosive fluids, Hastelloy-C materials of construction.

	Sensor Type	Material of Construction	All Welded	Standard Temperature Range to 350 °F [177 °C]	High Temperature Range to 500 °F [260 °C]	Ultra-High Temperature Range to 850 °F [454 °C]
ST98 Insertion	–FP	316L Stainless Steel	Yes	✔		ST98 HT *(new)* ✔
	–FP	Hastelloy-C	Yes	✔		ST98 HT *(new)* ✔
	–S	316L Stainless Steel	Yes	✔	✔	ST98 HT ✔
	–S	Hastelloy-C	Yes	✔	✔	ST98 HT ✔
ST98L In-Line	–F	316L Stainless Steel	Yes	✔		
	–F	Hastelloy-C	Yes	✔		
	–S	316L Stainless Steel	Yes	✔		
	–S	Hastelloy-C	Yes	✔		

Find your gas here?

FCI has provided thermal mass flow meter solutions for all of these and more…

Acetaldehyde
Acetic Acid
Acetone
Acetonitrile
Acetyl Chloride
Acetylene
Air
Allyl Chloride
Ammonia
Aniline
Argon
Benzene
Bio-Gas ($CH_4 + CO_2$)
Boron Trifluoride
Bromine
Bromobenzene
Butadiene
Butene
Butylene Oxide
Butyne
Carbon Dioxide
Carbon Disulfide
Carbon Monoxide
Carbon Tetrachloride
Carbonyl Sulfide
Chlorine
Chlorobenzene
Chloroethane
Chloroform
Chloromethane
Chloroprene
Cis-2-Butene
Cis-2-Hexene
Cumene
Cyanogen
Cyclobutane
Cyclohexane
Cyclooctane
Cyclopentane
Cyclopropane
Decene
Deuterium
Deuterium Oxide
Diethyl Amine
Diethyl Ether
Diethyl Ketone
Digester Gas (CH_4+CO_2)
Dimethyl Ether
Dimethyl Propane
Dimethyl Sulfide
Ethane
Ethanol
Ethyl Acetate
Ethyl Acrylate
Ethyl Alcohol
Ethyl Amine
Ethyl Benzene
Ethyl Bromide
Ethyl Chloride
Ethyl Fluoride
Ethyl Mercaptan
Ethylene
Ethylene Dichloride
Ethylene Oxide
Flare Gas
Fluorine
Fluorobenzene
Fluoroform
Freon-11
Freon-12
Freon-13
Freon-14
Freon-21
Freon-22
Freon-23
Furan
Halon
Helium
Heptene
Hexanol
Hexene
Hydrazine
Hydrogen
Hydrogen Bromide
Hydrogen Chloride
Hydrogen Cyanide
Hydrogen Deuteride
Hydrogen Fluoride
Hydrogen Iodide
Hydrogen Peroxide
Hydrogen Sulfide
Iodine
Isobutane
Isobutene
Isobutyl Alcohol
Isoheptane
Isohexane
Isooctane
Isopentane
Isoprene
Isopropyl Alcohol
Isopropyl Amine
Ketene
Krypton
Landfill Gas ($CH_4 + CO_2$)
M-Cresol
Mercury
Methane
Methanol
Methyl Acetate
Methyl Alcohol
Methyl Amine
Methyl Butane
Methyl Fluoride
Methyl Formate
Methyl Hexane
Methyl Hydrazine
Methyl Mercaptan
Methyl Octane
Methyl Pentane
Methylal
Methylene Chloride
Morpholine
M-Xylene
Naphthalene
Natural Gas
N-Butane
N-Butane
N-Butanol
N-Butyl Alcohol
N-Decane
N-Dodecane
Neon
Neopentane
N-Heptane
N-Hexane
Nitric Oxide
Nitrogen
Nitrogen Dioxide
Nitromethane
Nitrous Oxide
N-Nonane
N-Octane
Nonene
N-Pentane
N-Propanol
N-Propyl Alcohol
N-Propyl Amine
N-Undecane
Octene
Oxygen
O-Xylene
Ozone
Pentanol
Pentene
Phenol
Phosgene
Propadiene
Propane
Propanol
Propyl Chloride
Propylene
Propylene Oxide
Propyne
P-Xylene
R-11
R-112
R-113
R-114
R-114B2
R-115
R-116
R-12
R-13
R-13B1
R-14
R-142B
R-152A
R-21
R-216
R-22
R-23
R-500
R-502
R-503
R-504
Radon
R-C318
Saturated Steam
Silane
Silicon Tetrachloride
Styrene
Sulfur Dioxide
Sulfur Hexafluoride
Sulfur Trioxide
Superheated
Thiophene
Titanium Tetrachloride
Toluene
Trans-2-Butene
Trimethyl Amine
Triptane
Uranium Hexafluoride
Vinyl Acetate
Vinyl Chloride
Vinyl Fluoride
Vinyl Formate
Water Vapor

Robust, Rugged Electronics and Transmitter

ST98 Series transmitters feature robust, microprocessor-based electronics that undergo rigorous testing and quality assurance checks to ensure continuous, reliable long-term operation in the most demanding installations. The electronics feature FCI's exclusive, multi-poly curve fit linearization technique to achieve maximum flow measurement accuracy and repeatability. All gas calibration data specifics for your meter and your application are stored in non-volatile memory and always retained in the event of a power loss.

All wiring terminal blocks are easily and safely accessed through the ST98 enclosure's front door or via the removable dual-covers of the explosion-proof transmitter. The instrument's universal power supply accepts AC (85 to 260 volts) or 24 Vdc. The transmitter's analog output is field selectable as 4-20 mA, 0-5 Vdc, or 0-10 Vdc. An optional digital, 2 line-by-16 character LCD is available to display flow, temperature and total flow.

Digital Communications

ST98 Series models include a serial RS232C I/O port. Instrument configuration and comprehensive diagnostics are performed via simple connection to a portable PC via hyperterminal mode, or via a FCI Model FC88 portable programmer. Actual measurements, including flow rate, total flow, temperature values, and diagnostics are continuously accessible from the serial output. The industry standard HART and PROFIBUS digital communications protocols are also an available option.

FC88

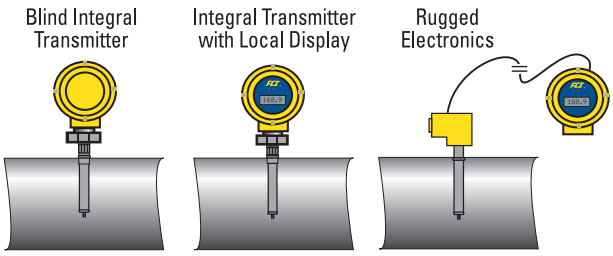
HART® FIELD COMMUNICATIONS PROTOCOL

PROFI® PROCESS FIELD BUS

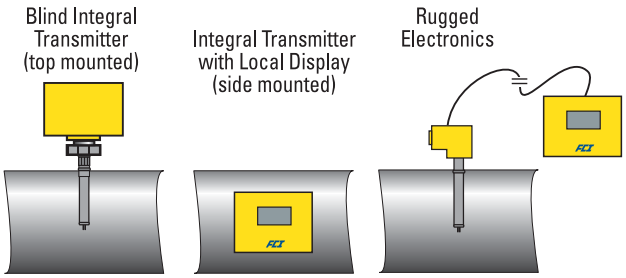
- **HART Field Communications Protocol** For connection in HART networks, the ST98 flow transmitter supports two-way communications for easy access to measured process data, diagnostics, calibration and configuration information. Both flow and temperature data are available as PV1 and PV2 within the HART Protocol. FCI's HART manufacturer ID is 0000A6 and the ST98 device type is 0078. Device description (DD) files are installed and downloadable from the HART web site.
- **PROFIBUS Process Field Bus** ST98's PROFIBUS interface supports connection in a PROFIBUS network as a –DP device. The communications protocol is fully Profile 3 compatible. In addition, FCI optionally offers single instrument and enterprise level DTM software packages to facilitate and reduce the costs of integrating ST98 into the PROFIBUS network. ST98's PROFIBUS has been certified by the PROFIBUS organization, certification number Z01212.

ST98 Insertion

Hazardous Locations

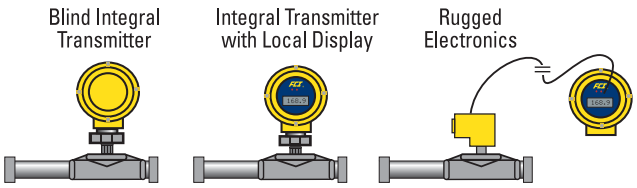


Non-hazardous Locations

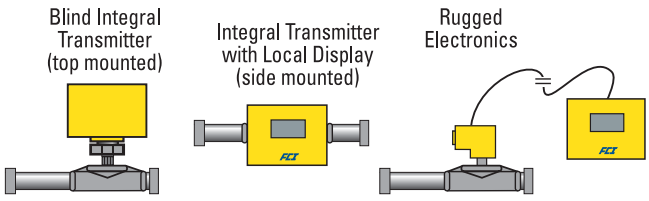


ST98L In-Line

Hazardous Locations



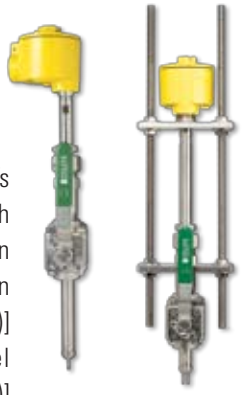
Non-hazardous Locations



Rugged Packaging for Long Service Life and Installation Choices to Match Your Application

ST98 flow meters are offered in several enclosure configurations to ensure application reliability, readability of the digital display, ease of installation and accessibility. These include a weatherproof, carbon steel NEMA/CSA Type 4 [IP66] rated enclosure, an aluminum NEMA/CSA Type 4X [IP66] rated enclosure, or an aluminum explosion-proof enclosure for hazardous locations. Agency approvals include FM, CSA, ATEX, GOST/RTN, IEC, CPA, and NEPSI. Any of the transmitter enclosure choices can be ordered integrally mounted with the sensor probe or for remote mounting up to 1000 feet (350m) away. Hazardous location approvals meet Class I & II, Div.1 & 2, Groups B, C, D, E, F & G; and per ATEX/IECEx II2 GD Exd IIC T4.

Process Connection Choices for Installation Ease



Packing Gland / Ball Valves

Standard process connections for the ST98's insertion flow element are a 3/4 or 1 inch male NPT stain-less steel compression fitting with either an adjustable teflon ferrule, rated to 150 psig [10 bar(g)] and 200 °F [93 °C], or a stainless steel ferrule, rated to 250 psig [17 bar(g)] and 500 °F [260 °C]. Optionally available are ANSI or DIN flanges, and retractable packing glands with 1 1/4 inch NPT or flanged connections. The ST98 insertion flow meter is offered in three standard element lengths of 6, 12, or 21 inches [152, 305 or 533 mm], which are field adjustable for final insertion depth to match your application. Longer and fixed insertion lengths, and all-welded process connections are also available upon request. High temperature service model ST98HT is available as a 1 inch male NPT or flanged in fixed insertion lengths up to 60 inches [1524 mm]. Adjustable insertion length requires retractable packing gland configuration.

For the ST98L in-line model, the standard process connections are male or female NPT and ANSI or DIN flanges. The flow tube or pipe length is 9-times its nominal diameter (e.g. a 1 inch pipe model will have a 9 inch long flow tube). Additionally, ST98L may be supplied with built-in Vortab® flow conditioners to reduce straight-run requirements and eliminate swirl and distorted flow profiles.

FCI Calibration Ensures Installed Accuracy

The ST98 Series is tested and calibrated to rigorous standards to ensure you get the instrument that does the job you specified. To design and produce the highest quality flow instrumentation, FCI operates a world-class NIST traceable flow calibration laboratory certified to meet such stringent standards as MIL-STD 45662A and ANSI/NCSL Z-540.

For most gases, FCI ST98 thermal dispersion flow meters are calibrated using the actual gas as well as the actual temperature and process conditions matching your application. Other suppliers are limited to air calibration with un-validated theoretical equivalencies for gases. FCI has demonstrated this procedure to be inferior and subject to installed errors well outside published specifications. For most other suppliers to perform actual gas calibrations equal to FCI, their flow meter must be sent to an outside laboratory resulting in extra costs and shipping delays to you.

FCI's calibration results in a flow meter you can install with total confidence and assurance that it meets your application needs.

More than 16 precision flow stands to match fluids, process conditions, flow rates and line sizes specified in your application.

ST98 Special Configurations

ST98HP – High and Ultra High Purity Applications

For gas applications in pharmaceutical, biotech, food, beverage, semiconductor, or other industries where high purity finishes are required, the model ST98HP is the solution. The ST98HP provides all of the standard features and options of the ST98, combined with electropolish finishes and sanitary process connections. ST98HP is available for line sizes 3/4 inch through 4 inches. The ST98HP is offered in two versions:

- **High Purity** 15Ra finish with a sanitary flange mated to a 316L in-line flow tube. The flow tube can be specified for either butt weld or sanitary flanged process connections.
- **Ultra High Purity** 10Ra finish with a VCR connector mated to a 316L in-line flow tube. The flow tube can be specified for either butt weld or sanitary flanged process connections.

ST98HP is engineered for High Purity applications.

The ST98HP for Ultra High Purity applications has a 10Ra finish.

ST98B – Compressed Air / Air / Nitrogen

Specifically for applications in compressed air, air, or nitrogen, FCI manufactures the ST98B models as standardized configurations of the ST98. The pre-configured and calibrated ST98B is easy to order and stocked for quick delivery.

Model ST98B-CA, for compressed air, is calibrated for a range of 6 to 600 SFPS [1.8 to 183 NMPS]. Model ST98B-AN, for air or nitrogen, is calibrated for 1.25 to 125 SFPS [0.4 to 38 NMPS]. The insertion element has a 3/4 inch diameter (with -FP element) and is offered in two U-lengths; 6 inch [152 mm] and 12 inch [395mm] with male NPT compression fitting and Teflon ferrule for field adjustment to the final insertion depth. The flow meter's transmitter housing is the NEMA 4 [IP66] carbon steel box, and can be ordered as a blind unit or with LCD digital display, in an integral or remote configuration. All other specifications of the ST98 insertion are standard.

Standardized ST98B models are pre-configured and calibrated for compressed air / air or nitrogen.

ST98 Special Treatments, Options and Accessories

Fluid Components International is committed to providing solutions for even the toughest application challenges. FCI has engineered a variety of options and accessories for ST98 models to perform in extraordinary conditions – just a few examples are shown here. Contact FCI with any special needs or for engineered solutions to your specific application.

- **Vortab Flow Conditioners** For plant conditions with limited piping straight-run or significant flow disturbances, FCI ensures accurate and repeatable measurements using Vortab flow conditioners. The patented, proven Vortab technology is widely recommended by industry experts to be the single most effective solution for flow conditioning and flow straightening. FCI is the only thermal dispersion flow technology provider authorized to provide Vortab flow conditioners with its products.

Vortab® Flow Conditioners ensure accurate and repeatable flow performance.

- **Sun and Wind Enclosure Shades** In outdoor installations with constant heat, glaring sun or blowing sand, special sun shades provide additional protection to ensure reliability and operations of the transmitter electronics and the LCD digital display when used with remote enclosures.

A sun and wind shade will help protect the remote transmitter.

- **Element Coatings and Materials** For service in highly corrosive gases or with erosive particulates, FCI can provide special coatings and wetted materials to protect the element and provide longer service life. Examples include Kynar, Tantalum, and Chromium Carbide.

Protective coatings are available for highly corrosive and erosive enviroments.

ST98 Series Features

Remote up to 1000' [350m]

Dual conduit ports for separate power input and signal output lines

Universal AC and DC power supply

Weather-proof, ruggedized, enclosures
- Choices for local or remote mounting
- Choices of NEMA/IP rated box or hazardous location installation

Easy-to-read, 2-line LCD display
- Display flow, temperature, and/or total flow with engineering units
- Display service codes

Global Agency Approvals of entire instrument for hazardous location installations:

FM, ATEX, CSA, IEC, GOST/RTN, CPA, NEPSI

Analog and digital communications outputs
- 4-20 mA or 0-10 Vdc
- RS232C, HART, or PROFIBUS DP

Multi-function: measures mass flow rate and temperature

Simple, adjustable installation with threaded NPT connector; Teflon or metal ferrule seals

Insertion and In-Line styles to match pipe size application

Stainless steel or Hastelloy-C wetted parts

All welded sensor elements for maximum service life and leak-proofing

Precision, wide-ranging Platinum RTD sensors

Exclusive equal mass elements provide optimum performance in processes with wide temperature swings

ST98 Series Mass Flow Meter General Specifications

Instrument

- **Flow Range**
  ST98 Insertion Flow Element: 0.75 SFPS to 600 SFPS [0.21 NMPS to 172 NMPS]
  ST98L In-Line Flow Accessory: 0.0062 SCFM to 1850 SCFM [0.01 Nm3/h to 3,140 Nm3/h]
  – Air at standard conditions; 70 °F and 14.7 psia [0 °C and 1013,25 bar (a)]
- **Media:** All gases that are compatible with the flow element material
- **Accuracy**
  Flow: ±1% reading, 0.5% full scale standard accuracy
  Temperature: ±2 °F [±2 °C] (display only, flow rate must be greater than 5 AFPS [1,5 m/sec])
  Special higher accuracy calibration options available; contact FCI
- **Repeatability**
  Flow: ±0.5% reading
  Temperature: ±1 °F [±1 °C] (flow rate must be greater than 5 AFPS)
- **Temperature Coefficient**
  With optional temperature compensation. Valid from 10% to 100% of full scale calibration.
  Flow: Maximum ±0.015% of reading / °F up to 850 °F [±0.03% of reading / °C up to 454 °C]
- **Turndown Ratio**
  Standard: Factory set and field adjustable from 10:1 to 100:1 within calibrated flow range
- **Temperature Compensation**
  Standard: ±30 °F [±16 °C]
  Optional: ±100 °F [±55 °C]
- **Agency Approvals**
  FM, ATEX, CSA, CRN, IEC, CPA, NEPSI, GOST/RTN, CE, PED (system approvals) **†**
- **Calibration:** Performed on NIST traceable equipment
- **MTBF (calculated):** 110 years

Flow Element

- **Material of Construction**
  All-welded 316L stainless steel; Hastelloy-C optional
- **Operating Pressure**
  Metal ferrule: 250 psig [17 bar (g)]
  Teflon ferrule: 150 psig [10 bar (g)]
- **Operating Temperature (Process)**
  ST98 Insertion Style:
  – FP type element: -40 °F to 350 °F [-40 °C to 177 °C]
  – S type element: -40 °F to 350 °F [-40 °C to 177 °C]
  – S type (optional) element: -40 °F to 500 °F [-40 °C to 260 °C]
  ST98 HT Insertion Style (High Temperature Service)**: *†**
  – FP type element: -40 °F to 850 °F [-40 °C to 454 °C]
  – S type element: -40 °F to 850 °F [-40 °C to 454 °C]
  ST98L In-Line Style:
  – F & – S type elements: -40 °F to 350 °F [-40 °C to 177 °C]
- **ST98 Insertion Flow Element**
  Process Connection:
  3/4″ or 1″ male NPT stainless steel compression fitting: adjustable Teflon ferrule; 150 psig [10 bar (g)] and 200 °F [93 °C] max., or metal ferrule; 250 psig [17 bar (g)] and 350 °F [177 °C] max.;
  thread-on flange optional; 1 1/4″ male NPT or flanged retractable packing gland optional*****

  Insertion Length: Field adjustable lengths –
  1″ to 6″ [25 to 152 mm]
  1″ to 12″ [25 to 305 mm]
  1″ to 21″ [25 to 533 mm]
  Custom lengths optional*****
- **ST98L In-Line Flow Tube**
  Insertion flow element is threaded and keyed in an in-line flow tube, calibrated and supplied as a spool-piece; accessories include low flow injection tubes and built-in Vortab flow conditioners for optimum low flow rangeability and performance

  Size: 1″ diameter tubing; 1″, 1 1/2″ or 2″ schedule 40 pipe
  Length: 9 nominal diameters
  Process Connection: Female NPT, male NPT, ANSI or DIN Flanges
  Option: Flanges sized for flow tube
- **Remote Transmitter Configuration:** Transmitter may be mounted remotely from flow element using interconnecting cable (up to 1000 feet [350m])*****

Flow Transmitter

- **Operating Temperature:** 0 °F to 140 °F [-18 ° to 60 °C]
- **Input Power:** 85 Vac to 265 Vac or 22 Vdc to 30 Vdc, 7 Watts maximum, 230 mA maximum
- **Outputs**
  Analog: Single output selectable as 4-20 mA****** (700 Ω max. load), 1-5 Vdc, 0-10 Vdc or 0-5 Vdc. (Vdc: 100K Ω min. load)

** *With fault indication per NAMUR, NE43 guideline: field selectable for high (≥21.6 mA) or low (≥3.75 mA) output signal is isolated from input power on AC Powered mode only)*

Digital: Standard: RS232C Serial I/O

Optional: HART, full two-way communications*****;
PROFIBUS, DP Profile 3 (Certification #Z01212)

Digital Display (optional): LCD, 2 line/16 character per line, indicating flow rate and process temperature and/or totalized flow

Other Options

- **Vortab Flow Conditioners:**
  Model ST98L (in-line) can be provided and system calibrated with Vortab flow conditioners; refer to FCI + Vortab literature and contact FCI
- **Model FC88:** Hand-held, portable FCI flow meter field programmer; attach to ST98 I/O port for instrument set-up and trouble shooting

* *Some configuration restrictions apply to ST98 HT configured for 850 °F [454 °C] service. These include, but may not be limited to the following: Must select remote transmitter configuration. HART output is standard. Insertion element is fixed length with 1″ male NPT or adjustable with selection of packing gland. Contact FCI for more information.*

† *Agency approvals for 850 °F [454 °C] version pending. Contact FCI for current availability.*

Enclosures

	For Integral Configurations (Flow Meter/Transmitter Together)		
Ordering Code Number	A	1	B
Type	Carbon Steel Box	Aluminum Box	Aluminum Round
Temperature	0 °F to 140 °F [-18 °C to 60 °C]	0 °F to 140 °F [-18 °C to 60 °C]	0 °F to 140 °F [-18 °C to 60 °C]
Environmental Rating	NEMA 4, IP66	NEMA 4X, IP66	NEMA 4X, IP66
Installation Area Rating (System Approvals)	Nonincendive for Class I, Division 2, Groups A,B,C,D; Suitable for Class II, Division 2 Groups F, G; Class III, Division 2	Nonincendive for Class I, Division 2, Groups A,B,C,D; Suitable for Class II, Division 2 Groups F, G; Class III, Division 2	Class I, Division 1 Hazardous Locations: Groups B,C,D, E, F, G; ATEX / IECEx II2 GD Exd IIC T4

	For Remote Configurations * (Flow Meter Element Separated from Transmitter)				
Ordering Code Number	Element	Transmitter	Transmitter	Transmitter	Transmitter
	C, 2, D or E	C	2	D	E
Type	Aluminum	Carbon Steel Box	Aluminum Box	Aluminum Round	Panel Mount
Temperature	0 °F to 140 °F [-18 °C to 60 °C]	0 °F to 140 °F [-18 °C to 60 °C]	0 °F to 140 °F [-18 °C to 60 °C]	0 °F to 140 °F [-18 °C to 60 °C]	0 °F to 140 °F [-18 °C to 60 °C]
Environmental Rating	NEMA 4, IP67	NEMA 4, IP66	NEMA 4X, IP66	NEMA 4X, IP66	None
Installation Area Rating (System Approvals)	Class I, Division 1 Hazardous Locations: Groups B,C, D, E, F, G; ATEX / IECEx II2 GD Exd IIC T4	Nonincendive for Class I, Division 2, Groups A,B,C,D; Suitable for Class II, Division 2 Groups F, G; Class III, Division 2	Nonincendive for Class I, Division 2, Groups A,B,C,D; Suitable for Class II, Division 2 Groups F, G; Class III, Division 2	Class I, Division 1 Hazardous Locations: Groups B,C,D, E, F, G; ATEX / IECEx II2 GD Exd IIC T4	None

More Air / Gas Mass Flow Meter Solutions

In addition to the ST98 Series, FCI manufactures a broad line of thermal dispersion flow meter products for industrial and plant applications. From general-purpose air flow measurement to special-function, mixed gas flare flows; from small line sizes to the largest stacks and ducts, FCI has the selection to best solve your applications and ensure optimum solutions. Contact your local FCI representative or visit **www.fluidcomponents.com** for detailed product information and specifications on these products.

ST50

- **ST50** is a compact and economical, yet full featured meter designed for air, compressed air and nitrogen applications.

ST75

- **ST75** is a compact, in-line meter with extensive standard features that is the economical, easy-to specify alternative to other maintenance intensive flow technologies.

GF90 Series

- **GF90** and **GF92** offer an extensive feature suite and unique 3-gas calibration option that solves the toughest industry application requirements.

GF03

- **GF03** is specifically designed for flare flow metering and to meet the stringent environmental regulations that apply to this application.

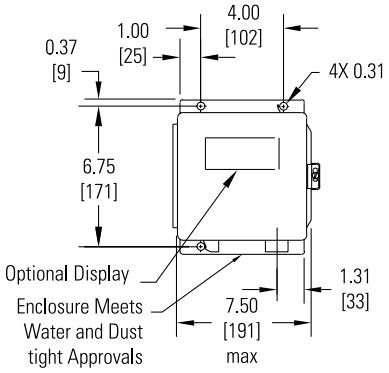
MT86 / MT91 Series

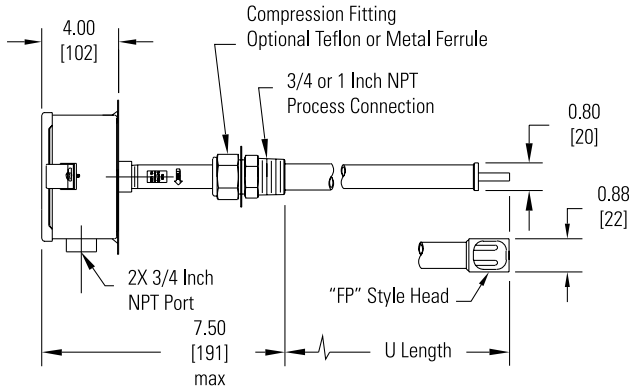
- **MT86** and **MT91** "multi-point" flow measuring systems can be configured with two (2) to sixteen (16) flow sensing elements to optimize measurements within the largest of pipe and duct sizes.

Model ST98 Insertion Flow Meter

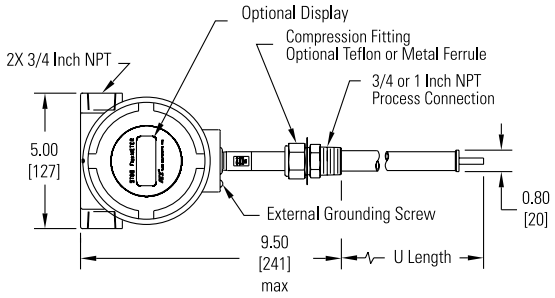
Integral Transmitter

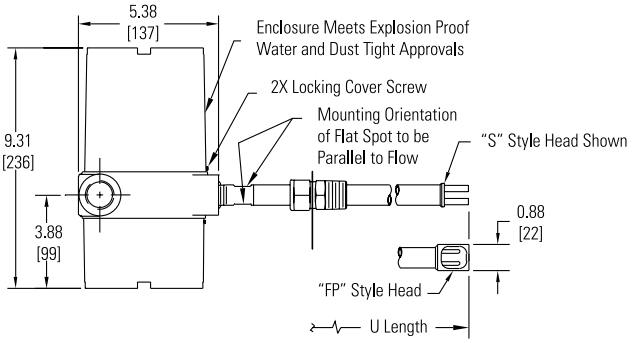
NEMA 4 Carbon Steel (Standard) or NEMA 4X, Aluminum





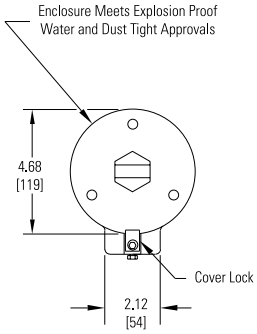
Hazardous Locations, Aluminum

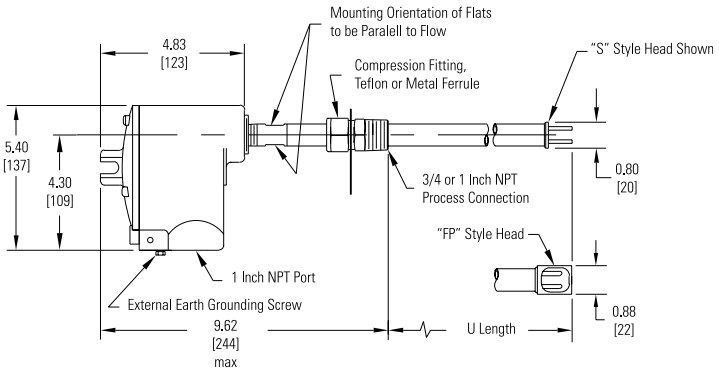




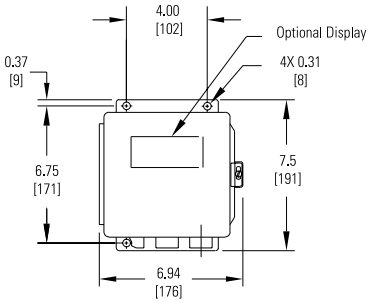
Remote Configuration

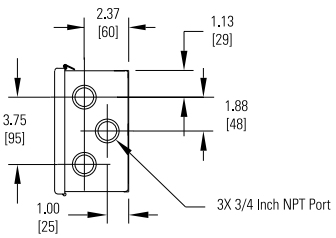
Flow Element: Hazardous Locations, Aluminum



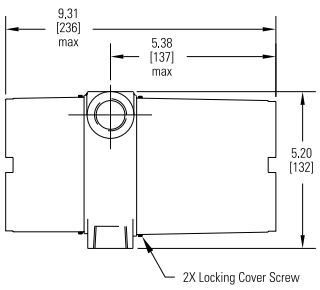


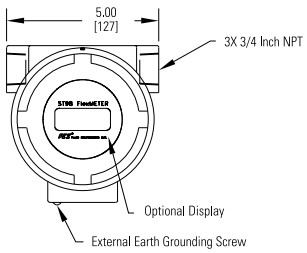
Enclosure: NEMA 4 Carbon Steel or NEMA 4X Aluminum





Enclosure: Hazardous Locations

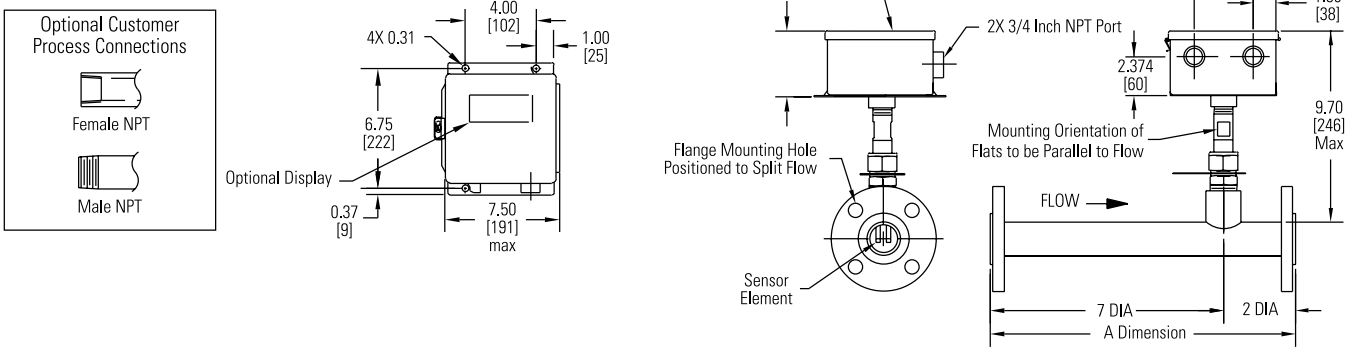




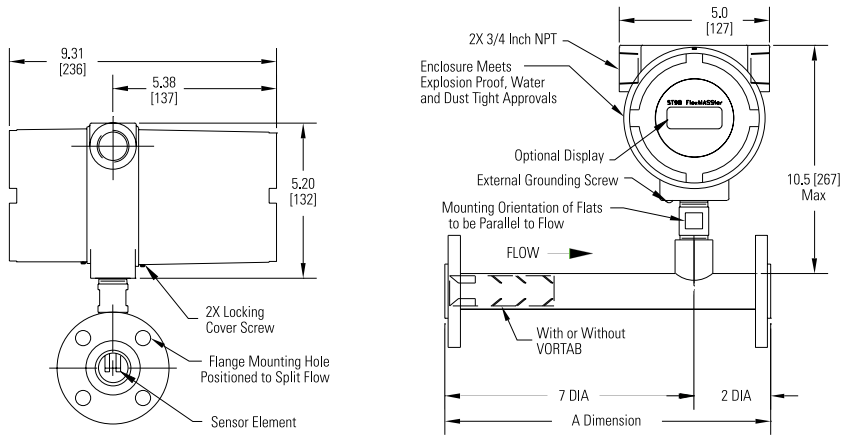
Model ST98L In-Line Flow Meter

Integral Transmitter

NEMA 4 Carbon Steel (Standard) or NEMA 4X, Aluminum



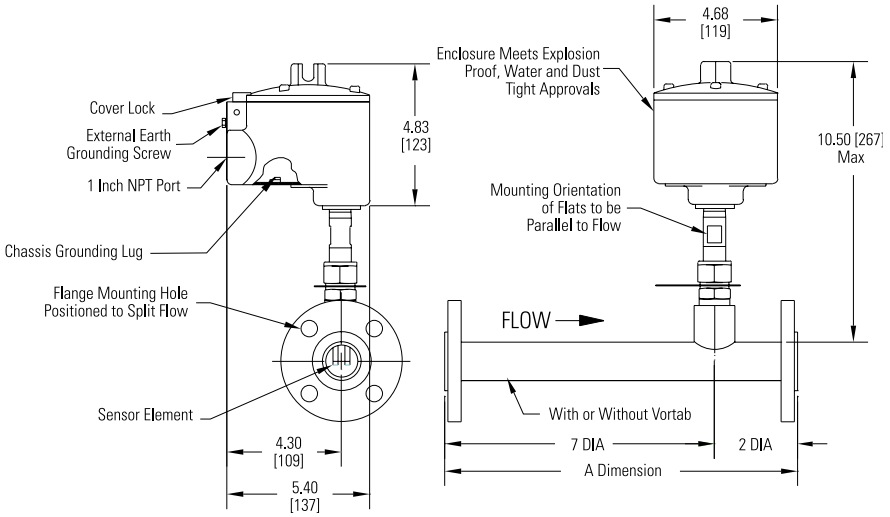
Hazardous Locations, Aluminum



Note: Optional flange connections are shown for reference only.
Standard process connection is male NPT.

Remote Configuration

Flow Element: Hazardous Locations, Aluminum
Transmitter: See Remote Configurations for ST98 Insertion Flowmeter



FCI® FLUID COMPONENTS INTERNATIONAL LLC

Locally Represented By:

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FCI is ISO 9001:2000 and AS9100 Certified

0509-0K **Doc. No. 02MK011469H**

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D-11
Ball Valves

D-12
Butterfly Valves

D-13
Ventilators

General Fan Schedule

Job Name: TGTRA

Job Notes: TAG V-1 & V-2

BARRY

Tag /Mark	FANV-1				
QTY	2				
Product Line	Breezeway P				
Model	P12RA				
Drive	Direct				
Flow Rate- (CFM)	1000				
SP - ("w.g.)	0.25				
Temperature - (F)	70.000				
Altitude - (ft.)	0				
RPM	1550.00				
BHP/Watts	147.00				
Motor	1/4 HP 115/1/60 Open				
Tip Speed - (ft/min)	4869.000				
Inlet Vel (ft/min)	1235				
Outlet Vel (ft/min)	1282.00				
SE%	0.00				
NE%	0.00				
Sones	13.79				
NC	65.00				
dBA	64.00				
Mounting Position	Wall				
Application	Exhaust				
Fan Notes					
Ro/Opng - (in)	0.00				
Dmpr.O.D.(in)	0.00				
Shipping W. - (lbs)	14.00				
Accessories:					
1	Breezeway Aluminum Wall Shutter	ALUMINUM WALL SHUTTER			
2	NEMA 1 - Disconnect				
3	Slip In Fan Pak				
4	Thermal Overload Protection				
5	Wall Sleeve w/Rear Guard				
6					
7					
8					
9					
10					
11					
12					
13					
14					
15					
Specials:					

X N62473-N-D-3211

I hereby certify that the (equipment) (material) (article) shown and marked in this submittal is that proposed to be incorporated into Contract Number _____, is in compliance with the Contract Drawings and Technical Specifications, can be installed in the allocated spaces, and is approved for use.

Certified by Submittal Reviewer S.P. Date 11/2/09

Certified by PQCM _____ Date _____

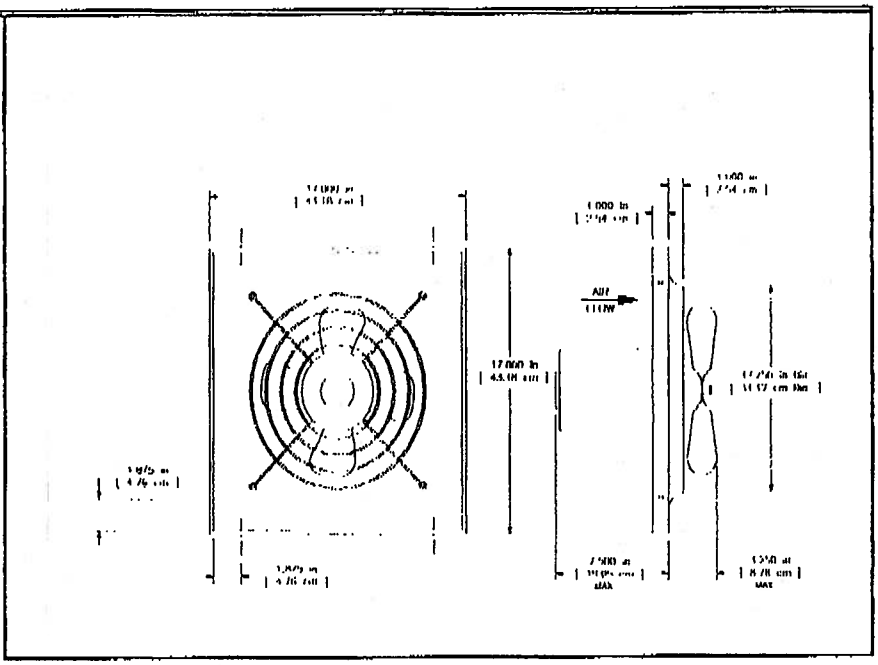
PennBarry
1401 N. Plano Road
Richardson, TX 75081

Job Name: TGTRA
Tag / Mark: FANV-1
Date: 9/24/2009

DIRECT DRIVE AXIAL WALL EXHAUST FAN

STANDARD CONSTRUCTION

Propellers aluminum, statically and dynamically balanced * Coated pre-punched panel with welded corners * Rear wire OSHA fan guard/motor mounting * Vibration isolation provided between panel & guard * Motors continuous duty, ball bearing design, & positively cooled * Corrosion resistant fasteners *



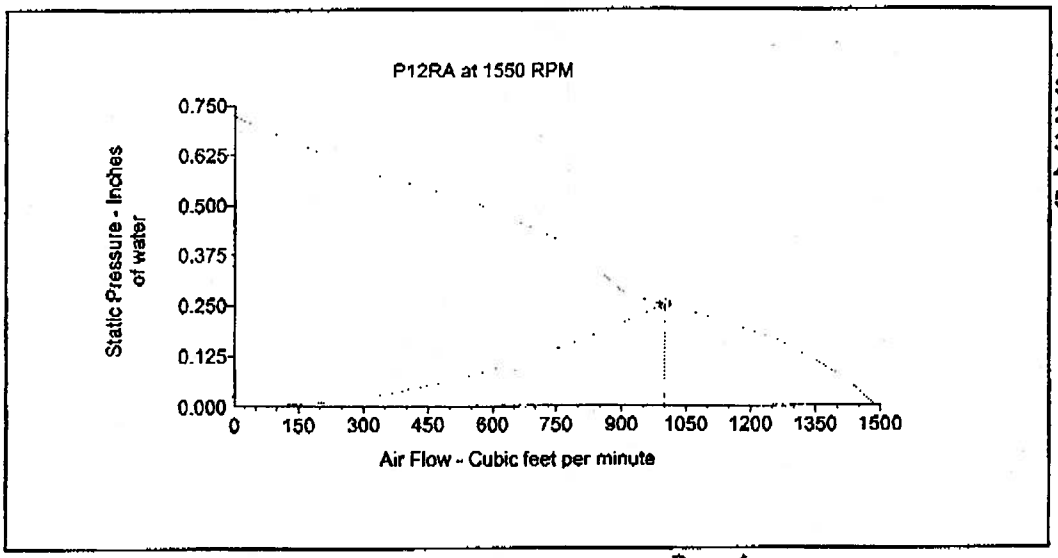
Note: All Dimensions shown are in units of inches

PERFORMANCE						
Qty	Model	Volume (CFM)	SP (in. w.c.)	RPM	BHP/Watts	TipSpeed
2	P12RA	1,000	0.25	1,550	147.00	4,869

MOTOR INFORMATION		
Motor HP	Volt/Ph/Hz	Enclosure
1/4	115/1/60	Open

DIMENSIONS		
Damper Size (in.)	RoOpng (in.)	Shipping Wgt. (lbs)
0X0	N/A	14

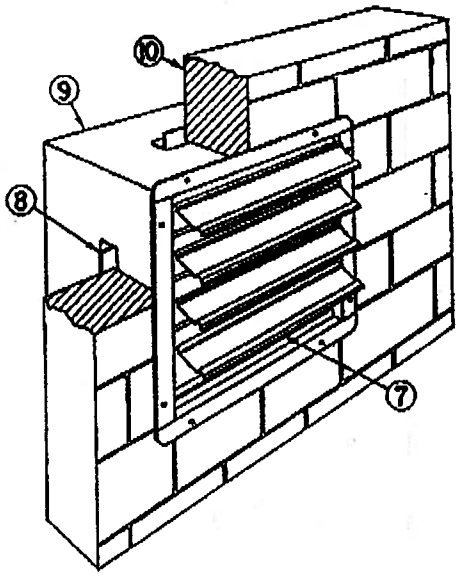
SOUND POWER (dB re 10^{-12})								LwA	Dba	Sones
OCTAVE POWER CENTER FREQUENCY (hz)										
63	125	250	500	1000	2000	4000	8000			
78	85	77	71	68	65	59	52	65	64	13.8

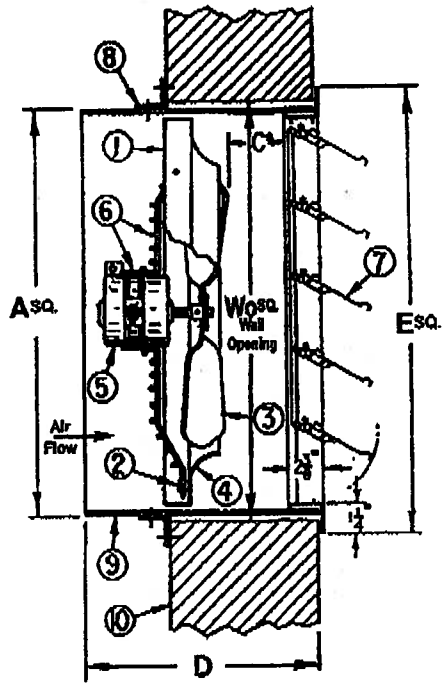


Accessories:
1) Breezeway Aluminum Wall Shutter
2) NEMA 1 - Disconnect
3) Slip In Fan Pak
4) Thermal Overload Protection
5) Wall Sleeve w/Rear Guard

Breezeway Slip-In Fan Pak

Model: P Series





Legend

1. Epoxy Coated Steel Panel
2. Anti-Vibration Mounts
3. Fan Blade
4. Venturi Orifice
5. Electric Fan Motor
6. Integral Rear Guard & Motor Mount
7. Wall Shutter (Self Attached)
8. Perimeter Angle Frame (Adjustable to Wall Thickness)
9. Galvanized Steel Wall Sleeve
10. Wall (By Others)

Dimensional Data

	Model					
	P10	P12	P16	P18	P20	P24
Wo$^{sq.}$	15 3/4	17 3/4	23 1/2	25	27 1/2	33 1/4
A$^{sq.}$	15 1/4	17 1/4	23	24 1/2	27	32 1/2
C* min.	4	4	4	4	5	5
D	18 3/4	18 3/4	22 3/4	23	24 3/4	30 3/4
E$^{sq.}$	17 5/8	19 5/8	25 3/8	26 7/8	29 3/8	34 7/8

All dimensions in inches.

Note: Additional guards should be installed when fans are located within seven feet of floor and/or working level or within reach of personnel. (Review OSHA codes for specific details.)

Material: Epoxy Coated Steel

PENN BARRY™
1401 North Plano Road, Richardson, TX 75081
Ph: 972.234.3202 Fax: 972.497.0468
www.PennBarry.com

Submittal Sheet

Breezeway - 'P' Series

Slip-In Fan Pak

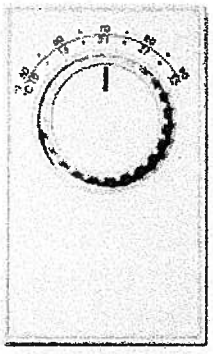
This drawing illustrates our understanding of order requirements. When approved, it represents details for fabrication, as such, PennBarry will not be responsible for revisions in the field or other changes after release for fabrication. Published and protected by PennBarry, Richardson, TX. All rights reserved. May not be reproduced partially or in full without permission from the publisher. No rights conveyed to manufacture partially or in full, use or sell either the method of construction represented or any invention in any way related thereto.

Thermostat,Line Volt

HVACR > HAVCR Controls > Line Voltage Thermostats

Line Voltage Thermostat, Heating Only, Switch Type SPST, Control Range 50 to 90 F, Voltage 120/208/240/277, Hei 2 3/4 In, Depth 2 3/4 In, Ambient Temp Range 50 to 90 F, Inductive Amps @120V 4.5, @208V 4.5, @240V 4.5, @27 Rating Resistive 120/208/240V 22, Sensing Method Bi-Metal Actuator, Finish Shadow White, Standards UL and CSA Celsius Temperature Scale

Grainger Item #	4PU49
Price (ea.)	**$22.77**
Brand	DAYTON
Mfr. Model #	4PU49
Ship Qty.	1
Sell Qty. (Will-Call)	1
Ship Weight (lbs.)	0.7
Usually Ships**	Today
Catalog Page No.	3821
Country of Origin	**USA**



Enlarge Image

Qty. [ ]

Add to Order | Add to Personal List | Compare Alternates

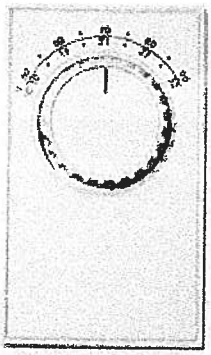
Price shown may not reflect your price. Sign in or register.

Tech Specs | Additional Information | Notes & Restrictions | MSDS | Required Accessories | Optional Accessories | Alternate Products

Item	Line Voltage Thermostat
Type	Heating Only
Switch Type	SPST
Switch Action	Open on Rise
Number of Switches	1
Control Range (F)	50 to 90
Differential (Deg. F)	3
Height (In.)	4 3/4
Width (In.)	2 3/4
Depth (In.)	2 3/4
Temp. Sensitivity (Deg. F)	+/-2 Degrees F
Sensor Type	Bimetal
Characteristics	Fahrenheit and Celsius Temperature Scale
Color	White
Application	Heating Only
Display	Analog
Voltage Range	120 to 277 VAC
Inductive Amps @ 120V	4.5
Inductive Amps @ 240V	4.5
Full Load Amps @ 120V	22
Full Load Amps @ 240VAC	22
Contact Rating Resistive @ 120V (A)	22

GRAINGER
FOR THE ONES WHO GET IT DONE

printed



Thermostat,Line Volt

Line Voltage Thermostat, Heating Only, Switch Type SPST, Control Range 50 to 90 F, Voltage 120/208/240/277, Height 4 3/4 In, Width 2 3/4 In, Depth 2 3/4 In, Ambient Temp Range 50 to 90 F, Inductive Amps @120V 4.5, @208V 4.5, @240V 4.5, @277V 4.0, Contact Rating Resistive 120/208/240V 22, Sensing Method Bi-Metal Actuator, Finish Shadow White, Standards UL and CSA, Fahrenheit and Celsius Temperature Scale

Grainger Item #	4PU49
Price (ea.)	**$22.77**
Brand	DAYTON
Mfr. Model #	4PU49
Ship Qty.	1
Sell Qty. (Will-Call)	1
Ship Weight (lbs.)	0.7
Usually Ships	Today
Catalog Page No.	3821

Price shown may not reflect your price. Log in or register.

Additional Info

Electric Heat Line Voltage Thermostats

For precise control of resistive-rated electric heating equipment.

All units are UL Listed and CSA Certified; Nos. 6WY23 and 6WY24 are C-UL Listed.

- Mount to standard 2 x 4" vertical box

Tech Specs

Item: Line Voltage Thermostat
Type: Heating Only
Switch Type: SPST
Switch Action: Open on Rise
Number of Switches: 1
Control Range (F): 50 to 90
Differential (Deg. F): 3
Height (In.): 4 3/4
Width (In.): 2 3/4
Depth (In.): 2 3/4
Temp. Sensitivity (Deg. F): +/-2 Degrees F
Sensor Type: Bimetal
Characteristics: Fahrenheit and Celsius

Optional Accessories

Guard,Thermostat,Clear

Item #: 2E430
Brand: APPROVED VENDOR
Usually Ships: Today
Price (ea): $28.15

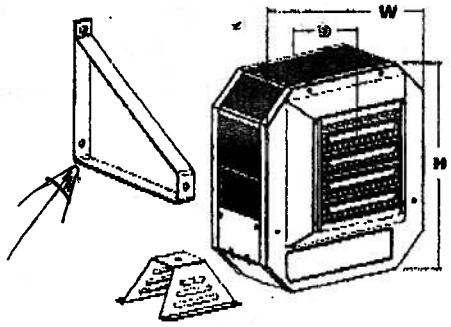
Alternate Products

Thermostat,Linevoltage

Item #: 4E036
Brand: WHITE-RODGERS
Usually Ships: Today

D-14
Unit Heaters

N62473-10-D-3211



I hereby certify that th... (article) shown and marked in ... that proposed to ... Number ... with ... Specifications, can ... spac...

kW	in. (mm)		
	H	W	D
3-5	16 1/2 (419)	15 3/4 (400)	10 (254)

Certified by Submittal Reviewer ... Date 11/6/59

Certified by PQCM ... Date ...

EGEB	Forced Air, Standard Duty Electric Unit Heater	Size	3	5
		kW	3	5
	cfm		308	308
	Shipping Weight (lbs)		42	42

Factory Installed Options

Supply Voltage/Phase	208/1	AK2	✓	✓
	208/1-3[c]	AK15	✓	✓
	208/3	AK5	✓	✓
	240/1	AK3E	✓	✓
	240/1-3[c]	AK16	✓	✓
	240/3	AK6E	✓	✓
	277/1	AK4	✓	✓
	347/1	AK34	✓	✓
	480/1	AK9E	✓	✓
	480/1-3[c]	AK17	✓	✓
	480/3	AK7E	✓	✓
	600/3	AK8E	✓	✓

[c] Units are field convertible from 1 to 3-phase.

Size				3	5
Disconnect Switch	40A (all voltages in sizes less than 7.5 KW)		BA14	✓	✓
	80A		BA15	■	■
	Supply Voltage	Control Voltage			
Control Voltage	208 to 240	208, 240	STD	✓	✓
	208 to 240	24	BT1	✓	✓
	277 to 600	24	STD	✓	✓
Manual reset high limit			BD6	✓	✓
Internal thermostat			IC11	✓	✓
Fan Controls	Unit mounted fan switch		BF4A	✓	✓
	Relay for 24V remote fan switch (by others) Requires 24V control voltage		BF5	✓	✓

Field Installed Options (Shipped Separately)

Size			3	5
Mounting accessories	Wall bracket for horizontal discharge	STD	✓	✓
	Ceiling bracket for horizontal discharge	STD	✓	✓
	Threaded rod inserts in back for vertical downblow (rod by others)	STD	✓	✓
Control Voltage	Kit to field convert STD 208-240V unit to 24V controls (BT1)	IRT3	✓	✓
	Kit to field install (retrofit) IC11 built-in thermostat	IT13	✓	✓
Thermostats	24V 40°F-80°F single stage wall thermostat	CL1A	✓	✓
	SPST single stage line voltage wall thermostat	CL5	✓	✓
Summer Fan Control Kits	Kit to field install BF4A fan switch for 208-240V units	CH2A	✓	✓
	Kit to field install BF4A fan switch for 277 to 600V units	CH2B	✓	✓
	Relay kit for 24V remote fans switch (by others) Requires 24V control voltage	IR3	✓	✓

REZNOR

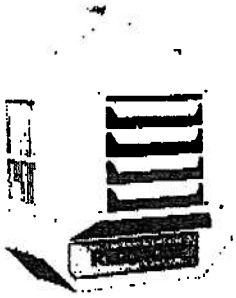
WALL MOUNTING BRACKET, DISCONNECT SWITCH AND THERMOSTATE FURNISH FOR EACH UNIT.

WALL HEATER .. (2) 5 KW UNITS TO BE FURNISHED

EGEB

Suspended, Electric Unit Heater

The EGEB provides flexibility with features mount on wall ceiling with the universal bracket, integral thermostat, 2 heat selection and fan only operation.



factory *warehouse* *garage* *store* *shipping room*

Features

Color	- Standard: almond.
Finish	- Standard: Epoxy/polyester powder paint.
Voltage/kW	- 208V, 240V, 277V and 480V - 3 to 5 kW.
Construction	- Draw-through design for more evenly heated air. - Specially designed outlet diffuser provides maximum air velocity. - Invidually adjustable louvres to direct discharge air flow. - Auto-reset over temperature protector. - 18 and 20 gauge steel.
Fan	- Motor - totally enclosed - thermally protected. - Motor mounted in ambiant air stream, shielded from heating elements. - Fan delay purges heater of residual heat for longer life.
Heating elements	- Stainless steel sheath with aluminum fins. - Draw-through design permits greater heat transfer.
Controls	- All models have factory installed contactor. - 24V control circuit standard on all models (except 3 & 5 kW, 208V/240V heaters). - 3 & 5 kW, 208V/240V heaters have 208V/240V control (24V control available). - Full line of unit mounted control accessories available (factory or field installed).
Installation	- Horizontal or vertical discharge air flow. - Includes wall and ceiling mounting brackets (for horizontal discharge air flow). - For vertical air flow 4 weld nuts (for threaded rod) provided in heater back. - Large and easily accessible control compartment. - Protection egg-crate allows lower mounting. - Minimum mounting height of 6 ft. (1.8 m).
Warranty	- 1-year warranty against defects.

Maximum Mounting Height

ft. (m)		
Horizontal Air Flow	Vertical Air Flow	kW
8 (2.4)	9 (2.7)	3-5

D-15
Louvers and Dampers

N62473-D-2-3211

I hereby certify that the (equipment) (material) (article) show... submittal is that proposed to be incorporated into Contract Number ... with the Contract Drawings and Technical Specifications, can be installed ... spaces, and is approved for use.

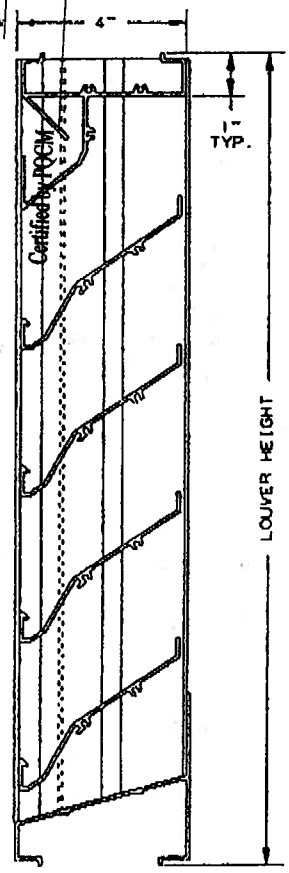
Certified by Submittal Reviewer B.P. Date 11/12/09

Certified by POCM Date

ARROW
EXTRUDED ALUMINUM LOUVERS 4" DEEP

TYPE EA-415-D

37° DRAIN BLADE-STATIONARY-CHANNEL TYPE



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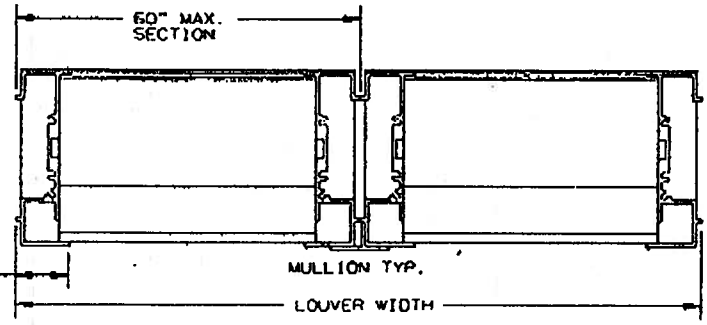
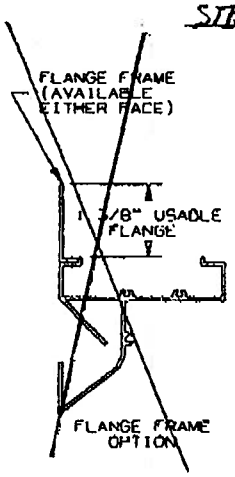




SPECIFICATIONS

MATERIAL: EXTRUDED ALUMINUM 6063-T6/T52 ALLOY AVAILABLE IN .091" THK. AND .125" THK. (NOMINAL).

FACE OF LOUVER: FULL WIDTH SILL WITH HEAD AND BLADES CONTAINED WITHIN JAMBS. APPROXIMATE BLADE CENTERS 3 1/2".

SCREEN: (WHEN INDICATED, IN A REMOVABLE FRAME)
STAINLESS → BIRD SCREEN - 1/2" FLATTENED ALUMINUM, .051" THK.
OR - 1/2" SQ. MESH INTERMEDIATE DOUBLE-CRIMPED ALUMINUM WIRE, .063" DIA.
STAINLESS → OR - 18/16 MESH, .011" DIA. ALUMINUM WIRE INSECT SCREEN.

FINISH: CLEAR ANODIZE

MINIMUM PANEL SIZE: 12" x 12"
MAXIMUM SINGLE PANEL SIZE: 60" x 96"

LOUVER PERFORMANCE STATEMENT

LOUVER MODEL EA-415-D SHALL BE FABRICATED TO PROVIDE A MINIMUM OF (57%), 9.07 SQUARE FEET OF FREE AREA FOR A 48" x 48" SIZE LOUVER AND BEAR THE AMCA CERTIFIED RATINGS PROGRAM SEAL FOR AIR PERFORMANCE AND WATER PENETRATION. THE RATING SHALL SHOW A BEGINNING POINT OF WATER PENETRATION AT .01 OUNCES PER SQUARE FOOT OF FREE AREA AT A FREE AREA VELOCITY OF 1071 FEET PER MINUTE, (9714) CUBIC FEET PER MINUTE, WITH .185 INCHES WATER GAUGE PRESSURE DROP FOR AIR INTAKE.

FOR CERTIFIED RATINGS AUTHORIZED BY AMCA -SEE REVERSE SIDE

NOMINAL DEDUCTIONS WILL BE MADE TO THE OPENING SIZE GIVEN.

ITEM	QTY.	OPENING SIZE WIDTH	OPENING SIZE HEIGHT	LOUVER SIZE WIDTH	LOUVER SIZE HEIGHT	MULL	SCREENS TYPE	SCREENS LOC
	2	36	36				B/S	I
							I/S	I

UNION MADE

ARROW UNITED INDUSTRIES
A DIVISION OF MESTEK, INC.
314 RIVERSIDE DRIVE
WYALUSING, PA 18853
TEL: (570)746-1888 FAX: (570)746-9286

AGENT:

ARCH./ENG.:
CONTR.:
PROJECT:
EDR: ECN: JOB:
DATE: DWN.: DWG.:

866-D-MAY-2002-1

NOTE - EXISTING TREATMENT BLG WALL THICKNESS IS 12"
- COUNTER WILL BE FURNISHED WITH DAMPERS

LOUVER MODEL EA-415-D

37° DRAIN BLADE

EXTRUDED ALUMINUM - STATIONARY

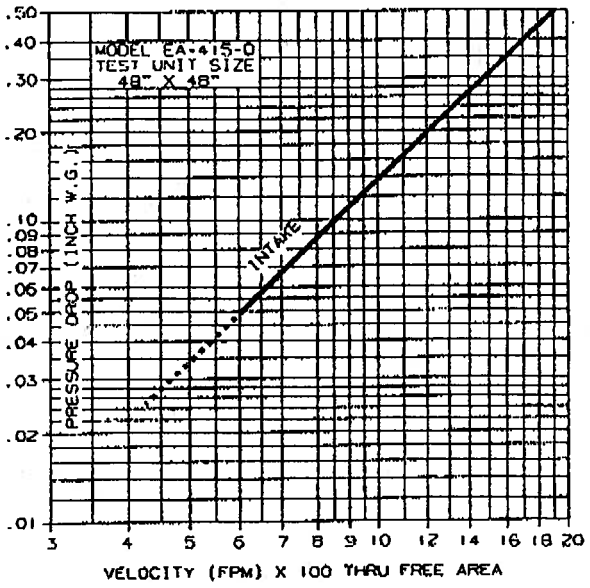
PERFORMANCE DATA

EXCELLENT WEATHER PROTECTION WITH LITTLE PRESSURE LOSS.

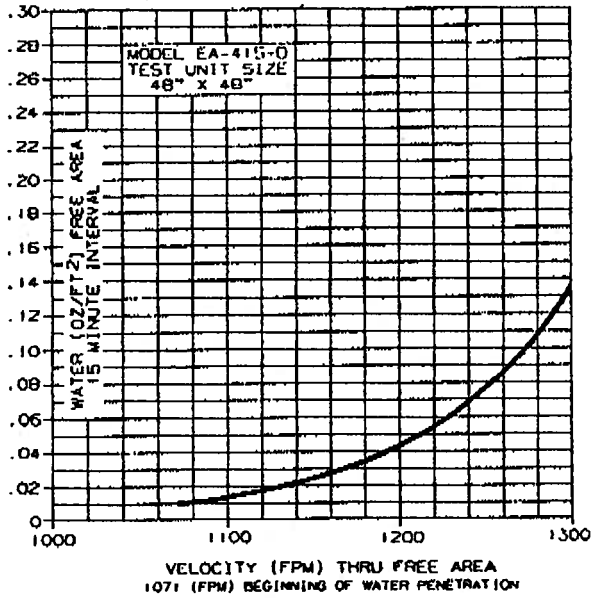
TESTS OF A 48" X 48" SAMPLE BY AN *AMCA ACCREDITED LABORATORY ACCORDING TO AMCA STANDARD 500 SHOWS LOW WATER PENETRATION. TESTS SHOW LESS THAN .02 OZ. PER SQ. FT. WATER PENETRATION AT 1100 FPM (FREE AREA VELOCITY) WITH LESS THAN .18" W.G. PRESSURE DROP (INTAKE).

RATINGS DO NOT INCLUDE THE EFFECT OF BIRDSCREEN.

PRESSURE DROP



WATER PENETRATION



FREE AREA

HEIGHT \ WIDTH	12"	18"	24"	30"	36"	42"	48"	54"	60"
	FREE AREA (SQ. FT.)								
12"	.33	.53	.74	.95	1.16	1.36	1.57	1.77	1.98
24"	.80	1.30	1.81	2.31	2.82	3.32	3.82	4.33	4.83
36"	1.26	2.05	2.84	3.64	4.43	5.23	6.02	6.81	7.61
48"	1.84	3.00	4.16	5.32	6.48	7.64	9.07	9.97	11.13
60"	2.25	3.68	5.10	6.52	7.95	9.37	10.79	12.21	13.64
72"	2.83	4.62	6.41	8.20	9.99	11.78	13.57	15.36	17.15
84"	3.29	5.37	7.45	9.53	11.61	13.69	15.77	17.85	19.93
96"	3.82	6.23	8.64	11.05	13.47	15.88	18.29	20.70	23.11

amca CERTIFIED RATINGS WATER AIR AIR MOVEMENT AND CONTROL ASSOCIATION INTERNATIONAL, INC.

ARROW UNITED CERTIFIES THAT THE MODEL EA-415-D SHOWN HEREIN IS LICENSED TO BEAR THE AMCA SEAL. THE RATINGS SHOWN ARE BASED ON TESTS AND PROCEDURES PERFORMED IN ACCORDANCE WITH THE AMCA PUBLICATION 511 AND COMPLY WITH THE REQUIREMENTS OF THE AMCA CERTIFIED RATINGS PROGRAM. THE AMCA CERTIFIED RATINGS SEAL APPLIES TO AIR PERFORMANCE RATINGS AND WATER PENETRATION RATINGS.

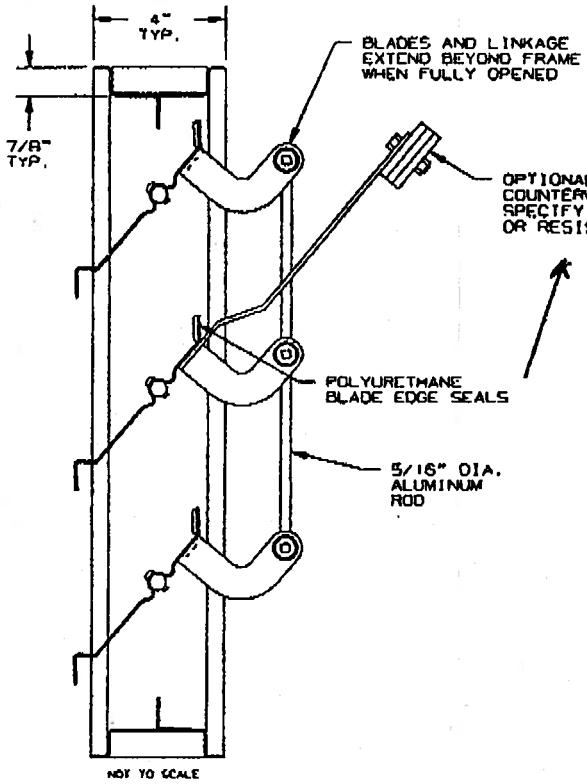
* AMCA ACCREDITED LABORATORY IS A LABORATORY EQUIPPED AND STAFFED TO CONDUCT TESTS ACCORDING TO THE APPROPRIATE AMCA TESTS METHOD AND WHICH HAS BEEN LICENSED AS A AMCA ACCREDITED LABORATORY.

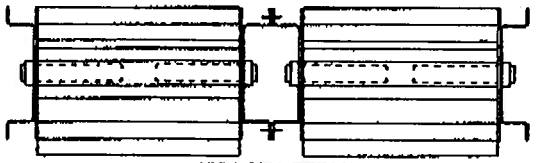
866-C-MAY-2002-2

ARROW
BACKDRAFT DAMPERS
FORMED STEEL

TYPE 366

FOR INTAKE OR DISCHARGE APPLICATIONS





SPECIFICATIONS

FRAMES: 16 GA. GALVANIZED STEEL. HAT-SHAPED CHANNEL FRAME.

BLADES: 16 GA. GALVANIZED STEEL, ON 8" C-C SPACING (MAX).

SHAFT: 1/2" DIA. PLATED STEEL STUB 6" LONG, MONO-BOLTED TO BLADE.

LINKAGE: 1/8" THK. PLATED STEEL BRACKET WITH 1/2" DIA. STEEL PIVOT IN A CELCON SLEEVE BEARING. LINKAGE ROD IS 5/16" DIA. ALUMINUM, LOCKED TO PIVOT WITH 1/4-20 UNC PLATED STEEL SET SCREW.

BEARINGS: OIL IMPREGNATED SINTERED BRONZE, FLANGED SLEEVE.

FINISH: FACTORY MILL.

SEALS: 3/16" THICK POLYURETHANE FOAM AT BLADE EDGES, NONE AT JAMBS.

OPERATING TEMPERATURE LIMITS: -30°F TO 180°F

SIZE LIMITS: MINIMUM: 8" WIDEx11" HIGH
MAXIMUM: 48" WIDEx72" HIGH

AVALIABLE OPTIONS OR VARIATIONS.
- HEAVIER FRAME AND BLADES TO 10 GA.
- HEAVIER SHAFTS TO 1" DIA.
- ALUMINUM BLADES AND SHAFTS.
- NEOPRENE BLADE EDGE SEALS.
- POLYURETHANE OR NEOPRENE JAMB SEALS.
- STAINLESS STEEL FRAME AND BLADES.
- STAINLESS STEEL SHAFTS.
- STAINLESS STEEL LINKAGE.
- ADJUSTABLE COUNTERWEIGHTS TO ASSIST OR RESIST OPENING.
- ADJUSTABLE COUNTERWEIGHTS FOR EXTERNAL APPLICATIONS ON EXTENDED SHAFT.
- OTHER FRAME CONTOURS.
- OTHER BEARINGS: NYLON, BALL, SINTERED STAINLESS STEEL.

WHEN A NON-SYMETRICAL FRAME CROSS SECTION IS SPECIFIED (I.E.: FLANGED), SPECIFY THE FLANGE/AIRFLOW ORIENTATION.

SPECIFY AIR FLOW-HORIZONTAL, VERTICAL-UP, OR VERTICAL-DOWN.

FOR PERFORMANCE DATA SEE REVERSE SIDE

NOMINAL DEDUCTIONS WILL BE MADE TO THE OPENING SIZE GIVEN.

ITEM	QTY.	OPENING SIZE WIDTH	OPENING SIZE HEIGHT	DAMPER SIZE WIDTH	DAMPER SIZE HEIGHT	MULL	COUNTER BALANCE	AIR FLOW (DIRECTION)
	2	36	36				HORIZONTAL AIR FLOW	EXHAUST

UNION MADE

ARROW UNITED INDUSTRIES
A DIVISION OF MESTEK, INC.
314 RIVERSIDE DRIVE
WYALUSING, PA 18853
TEL: (570)746-1888 FAX: (570)746-9286

AGENT: _____

ARCH./ENG.:
CONTR.:
PROJECT:
EQR: ECN: JOB:
DATE: DWN.: DWG.:

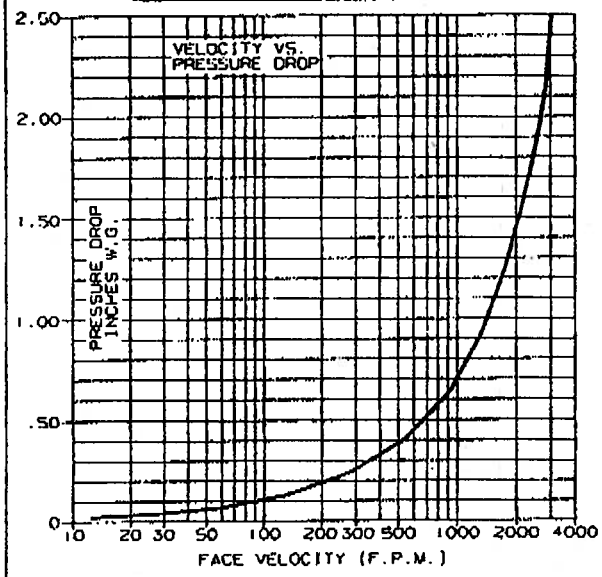
ARROW MODEL 366 BACKDRAFT DAMPER PERFORMANCE DATA

WITHOUT DUCTWORK

DAMPER INSTALLED PER AMCA 500 FIG. 5.4 (FACE MOUNTED TO A PLENUM).

PRESSURE IS CORRECTED TO .075 LB./CU.FT. AIR DENSITY.

OPERATIONAL PRESSURES
START TO OPEN - .01 INCHES W.G.
FULLY OPEN - 2.5 INCHES W.G.

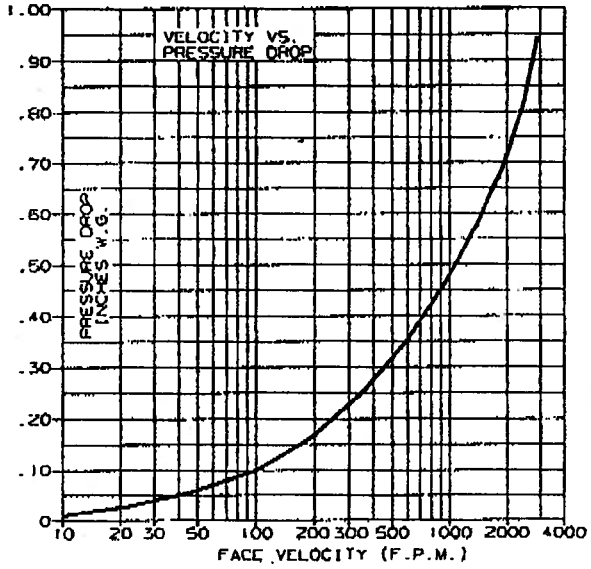


WITH DUCTWORK

DAMPER INSTALLED PER AMCA 500 FIG. 5.3 (DUCTWORK INSTALLED UPSTREAM AND DOWNSTREAM OF DAMPER).

PRESSURE IS CORRECTED TO .075 LB./CU. FT. AIR DENSITY.

OPERATIONAL PRESSURES
START TO OPEN - .01 INCHES W.G.
FULLY OPEN - .96 INCHES W.G.



TYPICAL PERFORMANCE FOR MODEL 366 BACKDRAFT DAMPER
SIZE TESTED 42" x 42", FURNISHED WITH COUNTERWEIGHT TO ASSIST OPENING.

AIR LEAKAGE

AIR LEAKAGE QUANTITIES SHOWN IN THE CHART ARE RESULTS OF TESTS PER AMCA STANDARD 500 AND ARE SHOWN AT 1" W.G. DIFFERENTIAL PRESSURE AND CORRECTED TO .075 LB./CU.FT. AIR DENSITY.

TOTAL CFM AIR LEAKAGE AT ONE INCH STATIC PRESSURE DIFFERENTIAL THROUGH CLOSED DAMPER.

DAMPER HEIGHT (INCHES)	DAMPER WIDTH (INCHES) 12"	18"	24"	30"	36"	42"	48"
12"	8.3	12.5	16.6	20.8	24.9	29.0	33.2
24"	16.6	24.9	33.2	41.5	49.8	58.1	66.4
36"	24.9	37.4	49.8	62.3	74.7	87.2	99.6
48"	33.2	49.8	66.4	83.0	99.6	116.2	132.8
60"	41.5	62.3	83.0	103.8	124.5	145.3	166.0
72"	49.8	74.7	99.6	124.5	149.4	174.3	199.2

FOR DETERMINING LEAKAGE VALUES GREATER THAN 1" W.G. TO A MAXIMUM 4" W.G. USE THE MULTIPLIER CORRECTION CHART BELOW.

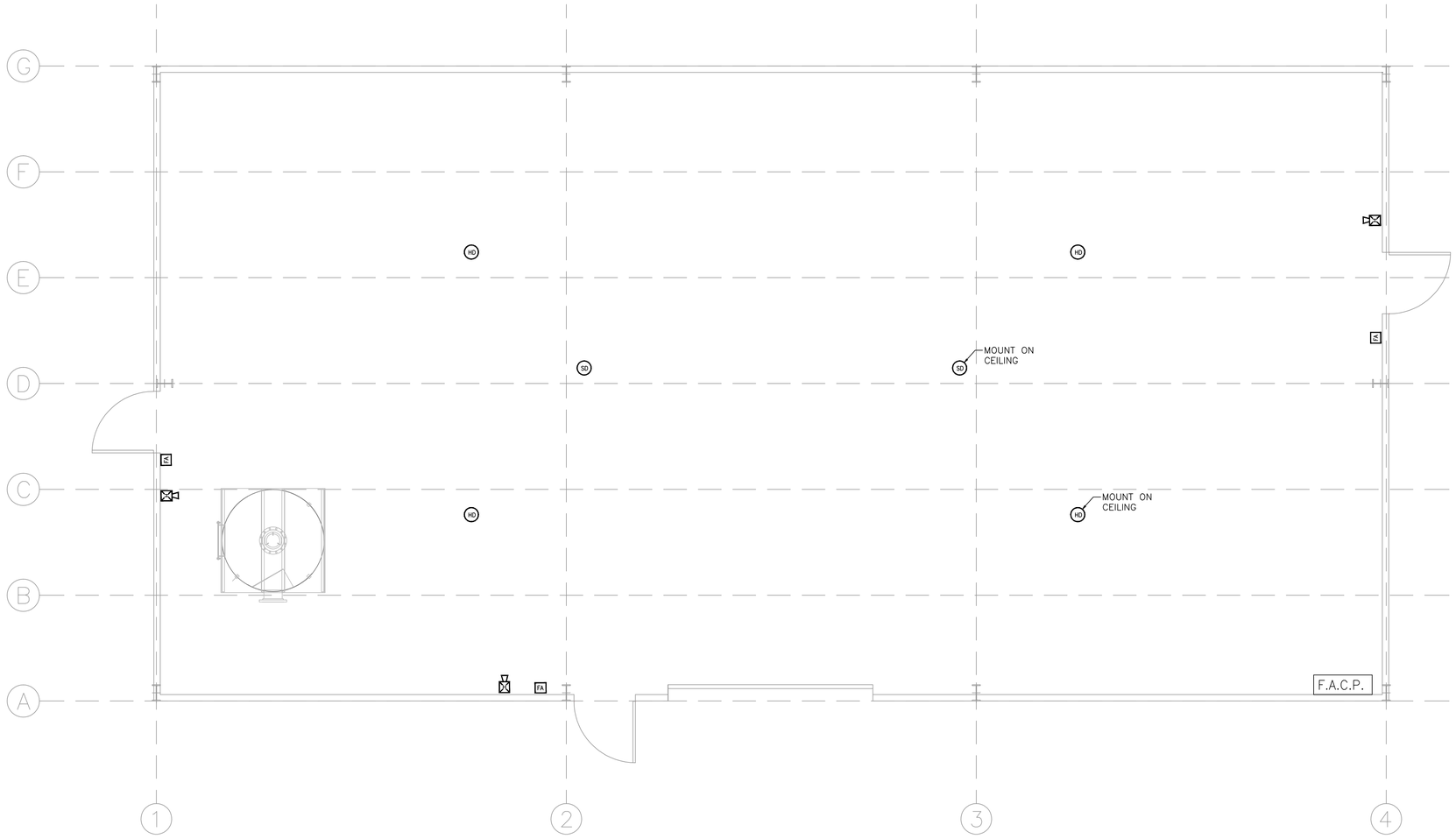
STATIC PRESSURE (IN)	2	3	4
MULTIPLIER CORRECTION FACTOR	1.22	1.63	1.99

*MAXIMUM PANEL SIZE LIMIT 48" x 72"

AIR LEAKAGE RATINGS ARE BASED ON AMCA STANDARD 500 USING TEST SET UP FIG. 5.4 WITH DAMPER IN THE CLOSED POSITION WITHOUT THE AID OF A COUNTERWEIGHT OR OTHER MECHANICAL MEANS TO PROVIDE CLOSING TORQUE. FOR A SIZE 42" x 42" DAMPER WITH BLADE & JAMB SEALS.

716-0-MAY-2002-2

D-16
Fire Alarm



FIRE ALARM SYMBOL LIST

FACP	1	FIRE ALARM CONTROL PANEL	GAMEWELL-FCI GF-505
FA	3	DOUBLE ACTION MANUAL PULL STATION	RSG RMS-IT-LPNY
SD	2	PHOTOELECTRIC SMOKE	SYSTEM SENSOR I-3
HD	4	HEAT DETECTOR	SYSTEM SENSOR 5601P
	3	HORN/STROBE	WHEELOCK AS-24MCWFR

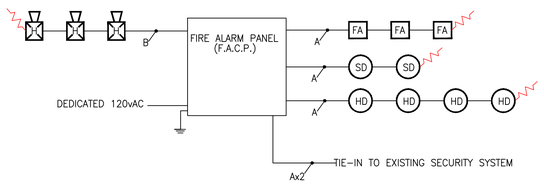
SEQUENCE OF OPERATIONS

ACTIVATION OF AREA HEAT DETECTOR	ACTIVATION OF AREA SMOKE DETECTOR	ACTIVATION OF MANUAL PULL STATIONS	TROUBLE CONDITION AT PANEL	
				NOTES: CENTRAL STATION ALARM SERVICE TO RECEIVE SEPARATE + DISTINCT SIGNALS AS FOLLOWS : A) FIRE ALARM B) TROUBLE SIGNALS
X	X	X		ACTIVATES HORNS AND STROBES THROUGHOUT THE BUILDING.
X	X	X	X	TRANSMIT SIGNAL TO CENTRAL STATION

WIRE SCHEDULE

A: ZONE WIRING: 16/2 AWG FPLP TWISTED NON SHIELDED
B: INDICATING CKT: 14/2 AWG FPLP TWISTED NON SHIELDED

ALL WIRING TO BE DONE CLASS "B"



FIRE ALARM RISER DIAGRAM

SCALE: N.T.S.

ELECTRICAL NOTES

1. ALL WIRING TO BE INSTALLED ACCORDING TO THE LATEST REVISION OF THE N.E.C. AND ALL OTHER SECTIONS OF THE N.F.P.A. STANDARDS.
2. ALL CONDUCTORS MUST TEST FREE OF GROUNDS, OPENS AND SHORTS.
3. ALL TERMINATIONS ARE TO BE SUPERVISED BY A REPRESENTATIVE OF GARLAND FIRE SYSTEMS (G.F.S.) PRIOR TO POWERING THE EQUIPMENT.
4. RECOMMEND WIRING AS SHOWN.
5. FOR COMPONENT WIRING SEE DETAIL SHEET AND PACKAGING MATERIAL.
6. SHOP DRAWINGS DO NOT DEPICT CONDUIT RUNS OR QUANTITY.
7. INSTALL AREA DETECTORS A MINIMUM OF 3' FROM ANY AIR DUCT.
8. PRIOR TO PLACEMENT OF CEILING MOUNTED OR DUCT MOUNTED SMOKE DETECTORS OR HEAT DETECTORS REVIEW MOUNTING INSTRUCTIONS AND PRECAUTIONS. CONTACT G.F.S FOR INSTALLATION REVIEW TO AVOID NUISANCE OR FALSE ALARMS.
9. MOUNTING HEIGHTS:
   A) MANUAL PULL STATIONS: 48" TO CENTER
   B) VISUAL: 80" TO THE BOTTOM OF THE DEVICE OR 6" BELOW THE CEILING.
10. EXACT LOCATIONS TO BE VERIFIED IN THE FIELD.

AHJ APPROVAL AREA

Garland Fire Systems
1-877-437-9350

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499 SOUTH MAIN STREET
FREEPORT, NEW YORK 11520
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REVISED BY:
REVISION: DESCRIPTION:

ENGINEER'S STAMP

NAVAL FACILITIES ENGINEERING COMMAND, MID-ATLANTIC
SITE 1, FORMER DRUM MARSHALLING AREA
SOIL VAPOR EXTRACTION CONTAINMENT SYSTEM
BETHPAGE, NEW YORK

FIRE ALARM LAYOUT, RISER AND NOTES.

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FA-1

Gamewell FCI
FIRE CONTROL INSTRUMENTS

by Honeywell

GF505 & GF510 Series

FIRE ALARM CONTROL PANELS

INSTALLATION, PROGRAMMING & OPERATION MANUAL

GAMEWELL-FCI
12 CLINTONVILLE ROAD
NORTHFORD, CT 06472

P/N: 53164 Rev. A
03/26/07 ECN 07-129

Fire Alarm System Limitations

While a fire alarm system may lower insurance rates, it is not a substitute for fire insurance!

An automatic fire alarm system–typically made up of smoke detectors, heat detectors, manual pull stations, audible warning devices, and a fire alarm control panel with remote notification capability–can provide early warning of a developing fire. Such a system, however, does not assure protection against property damage or loss of life resulting from a fire.

The Manufacturer recommends that smoke and/or heat detectors be located throughout a protected premise following the recommendations of the current edition of the National Fire Protection Association Standard 72 (NFPA 72), manufacturer's recommendations, State and local codes, and the recommendations contained in the Guides for Proper Use of System Smoke Detectors, which are made available at no charge to all installing dealers. These documents can be found at *http:/www.systemsensor.com/html/applicat.html*. A study by the Federal Emergency Management Agency (an agency of the United States government) indicated that smoke detectors may not go off in as many as 35% of all fires. While fire alarm systems are designed to provide early warning against fire, they do not guarantee warning or protection against fire. A fire alarm system may not provide timely or adequate warning, or simply may not function, for a variety of reasons:

Smoke detectors may not sense fire where smoke cannot reach the detectors such as in chimneys, in or behind walls, on roofs, or on the other side of closed doors. Smoke detectors also may not sense a fire on another level or floor of a building. A second-floor detector, for example, may not sense a first-floor or basement fire.

Particles of combustion or "smoke" from a developing fire may not reach the sensing chambers of smoke detectors because:

- Barriers such as closed or partially closed doors, walls, or chimneys may inhibit particle or smoke flow.
- Smoke particles may become "cold," stratify, and not reach the ceiling or upper walls where detectors are located.
- Smoke particles may be blown away from detectors by air outlets.
- Smoke particles may be drawn into air returns before reaching the detector.

The amount of "smoke" present may be insufficient to alarm smoke detectors. Smoke detectors are designed to alarm at various levels of smoke density. If such density levels are not created by a developing fire at the location of detectors, the detectors will not go into alarm.

Smoke detectors, even when working properly, have sensing limitations. Detectors that have photoelectronic sensing chambers tend to detect smoldering fires better than flaming fires, which have little visible smoke. Detectors that have ionizing-type sensing chambers tend to detect fast-flaming fires better than smoldering fires. Because fires develop in different ways and are often unpredictable in their growth, neither type of detector is necessarily best and a given type of detector may not provide adequate warning of a fire.

Smoke detectors cannot be expected to provide adequate warning of fires caused by arson, children playing with matches (especially in bedrooms), smoking in bed, and violent explosions (caused by escaping gas, improper storage of flammable materials, etc.).

Heat detectors do not sense particles of combustion and alarm only when heat on their sensors increases at a predetermined rate or reaches a predetermined level. Rate-of-rise heat detectors may be subject to reduced sensitivity over time. For this reason, the rate-of-rise feature of each detector should be tested at least once per year by a qualified fire protection specialist. *Heat detectors are designed to protect property, not life.*

IMPORTANT! ***Smoke detectors*** *must be installed in the same room as the control panel and in rooms used by the system for the connection of alarm transmission wiring, communications, signaling, and/or power.* If detectors are not so located, a developing fire may damage the alarm system, crippling its ability to report a fire.

Audible warning devices such as bells may not alert people if these devices are located on the other side of closed or partly open doors or are located on another floor of a building. Any warning device may fail to alert people with a disability or those who have recently consumed drugs, alcohol or medication. Please note that:

- Strobes can, under certain circumstances, cause seizures in people with conditions such as epilepsy.
- Studies have shown that certain people, even when they hear a fire alarm signal, do not respond or comprehend the meaning of the signal. It is the property owner's responsibility to conduct fire drills and other training exercise to make people aware of fire alarm signals and instruct them on the proper reaction to alarm signals.
- In rare instances, the sounding of a warning device can cause temporary or permanent hearing loss.

A fire alarm system will not operate without any electrical power. If AC power fails, the system will operate from standby batteries only for a specified time and only if the batteries have been properly maintained and replaced regularly.

Equipment used in the system may not be technically compatible with the control. It is essential to use only equipment listed for service with your control panel.

Telephone lines needed to transmit alarm signals from a premise to a central monitoring station may be out of service or temporarily disabled. For added protection against telephone line failure, backup radio transmission systems are recommended.

The most common cause of fire alarm malfunction is inadequate maintenance. To keep the entire fire alarm system in excellent working order, ongoing maintenance is required per the manufacturer's recommendations, and UL and NFPA standards. At a minimum, the requirements of NFPA 72 shall be followed. Environments with large amounts of dust, dirt or high air velocity require more frequent maintenance. A maintenance agreement should be arranged through the local manufacturer's representative. Maintenance should be scheduled monthly or as required by National and/or local fire codes and should be performed by authorized professional fire alarm installers only. Adequate written records of all inspections should be kept.

Installation Precautions

Adherence to the following will aid in problem-free installation with long-term reliability:

WARNING - *Several different sources of power can be connected to the fire alarm control panel.* Disconnect all sources of power before servicing. Control unit and associated equipment may be damaged by removing and/or inserting cards, modules, or interconnecting cables while the unit is energized. Do not attempt to install, service, or operate this unit until this manual is read and understood.

CAUTION - *System Reacceptance Test after Software Changes.* To ensure proper system operation, this product must be tested in accordance with NFPA 72 after any programming operation or change in site-specific software. Reacceptance testing is required after any change, addition or deletion of system components, or after any modification, repair or adjustment to system hardware or wiring.

All components, circuits, system operations, or software functions known to be affected by a change must be 100% tested. In addition, to ensure that other operations are not inadvertently affected, at least 10% of initiating devices that are not directly affected by the change, up to a maximum of 50 devices, must also be tested and proper system operation verified.

This system meets NFPA requirements for indoor dry operation at 0-49° C/32-120° F and at a relative humidity of 93 ±2% RH (non-condensing) at 32 ±2° C/90 ±3° F. However, the useful life of the system's standby batteries and the electronic components may be adversely affected by extreme temperature ranges and humidity. Therefore, it is recommended that this system and all peripherals be installed in an environment with a nominal room temperature of 15-27° C/60-80° F.

Verify that wire sizes are adequate for all initiating and indicating device loops. Refer to manual Specifications section for maximum allowable I.R. drop from the specified device voltage.

Like all solid state electronic devices, this system may operate erratically or can be damaged when subjected to lightning-induced transients. Although no system is completely immune from lightning transients and interferences, proper grounding will reduce susceptibility. *Overhead or outside aerial wiring is not recommended, due to an increased susceptibility to nearby lightning strikes.* Consult with the Technical Services Department if any problems are anticipated or encountered.

Disconnect AC power and batteries prior to removing or inserting circuit boards. Failure to do so can damage circuits.

Remove all electronic assemblies prior to any drilling, filing, reaming, or punching of the enclosure. When possible, make all cable entries from the sides or rear. Before making modifications, verify that they will not interfere with battery, transformer, and printed circuit board location.

Do not tighten screw terminals more than 9 in-lbs. Over-tightening may damage threads, resulting in reduced terminal contact pressure and difficulty with screw terminal removal.

This system contains static-sensitive components. Always ground yourself with a proper wrist strap before handling any circuits so that static charges are removed from the body. Use static-suppressive packaging to protect electronic assemblies removed from the unit.

Follow the instructions in the installation, operating, and programming manuals. These instructions must be followed to avoid damage to the control panel and associated equipment. FACP operation and reliability depend upon proper installation by authorized personnel.

FCC Warning

WARNING: This equipment generates, uses, and can radiate radio frequency energy and if not installed and used in accordance with the instruction manual, may cause interference to radio communications. It has been tested and found to comply with the limits for class A computing device pursuant to Subpart B of Part 15 of FCC Rules, which is designed to provide reasonable protection against such interference when operated in a commercial environment. Operation of this equipment in a residential area is likely to cause interference, in which case the user will be required to correct the interference at their own expense.

Canadian Requirements

This digital apparatus does not exceed the Class A limits for radiation noise emissions from digital apparatus set out in the Radio Interference Regulations of the Canadian Department of Communications.

Le present appareil numerique n'emet pas de bruits radioelectriques depassant les limites applicables aux appareils numeriques de la classe A prescrites dans le Reglement sur le brouillage radioelectrique edicte par le ministere des Communications du Canada.

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Notes

It is imperative that the installer understand the requirements of the Authority Having Jurisdiction (AHJ) and be familiar with the standards set forth by the following regulatory agencies:

- Underwriters Laboratories Standards
- NFPA 72 National Fire Alarm Code

Before proceeding, the installer should be familiar with the following documents.

NFPA Standards
This Fire Alarm Control Panel complies with the following NFPA Standards:

NFPA 72 National Fire Alarm Code for Local Fire Alarm Systems and Remote Station Fire Alarm Systems (requires an optional Remote Station Output Module)

Underwriters Laboratories Documents for Reference:
UL 38 Manually Actuated Signaling Boxes
UL 217 Smoke Detectors, Single and Multiple Station
UL 228 Door Closers–Holders for Fire Protective Signaling Systems
UL 268 Smoke Detectors for Fire Protective Signaling Systems
UL 268A Smoke Detectors for Duct Applications
UL 346 Waterflow Indicators for Fire Protective Signaling Systems
UL 464 Audible Signaling Appliances
UL 521 Heat Detectors for Fire Protective Signaling Systems
UL 864 Standard for Control Units for Fire Protective Signaling Systems
UL 1481 Power Supplies for Fire Protective Signaling Systems
UL 1638 Visual Signaling Appliances
UL 1971 Signaling Devices for Hearing Impaired

Other:

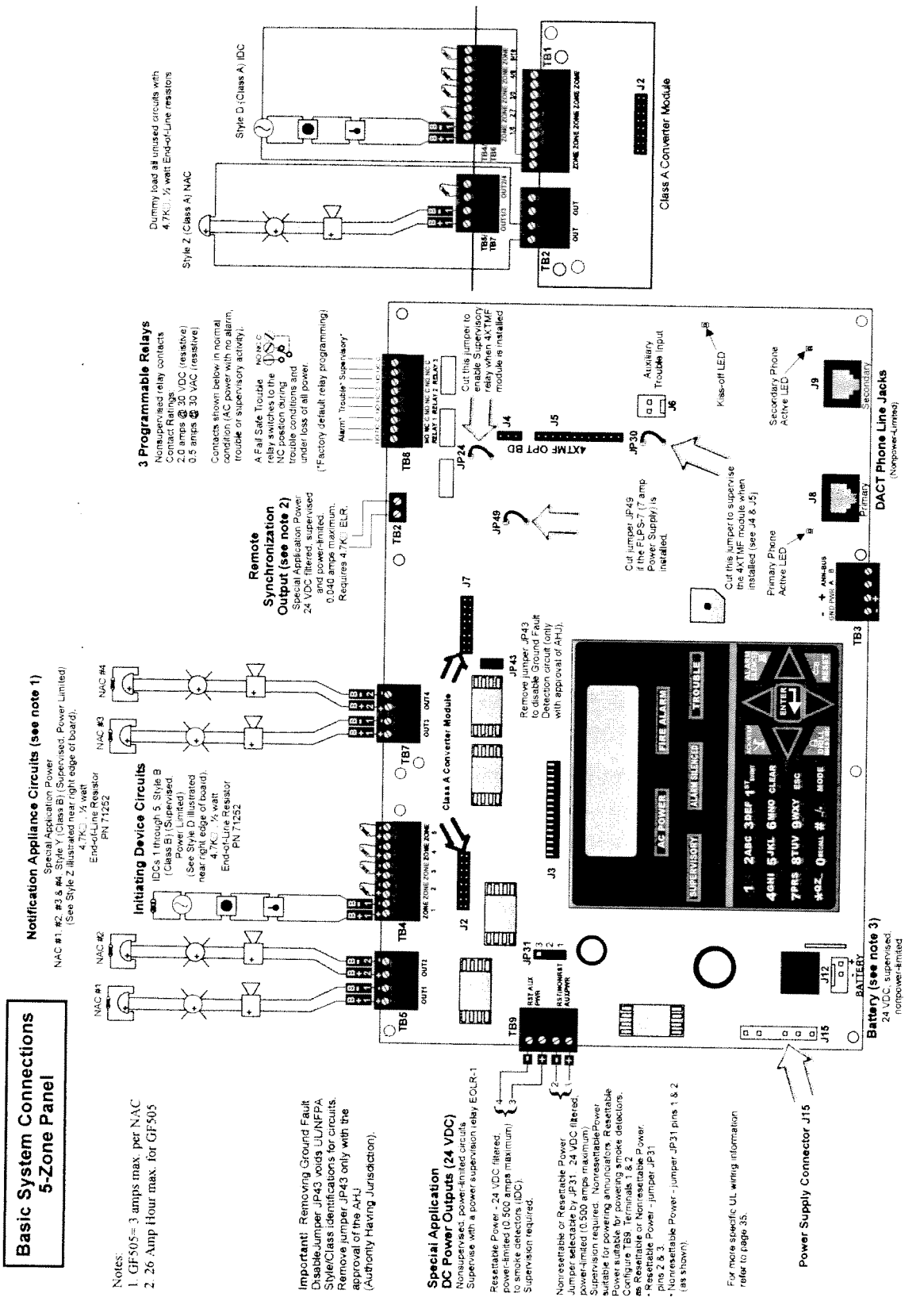
NEC Article 250 Grounding
NEC Article 300 Wiring Methods
NEC Article 760 Fire Protective Signaling Systems
Applicable Local and State Building Codes
Requirements of the Local Authority Having Jurisdiction (LAHJ)

Gamewell-FCI Documents

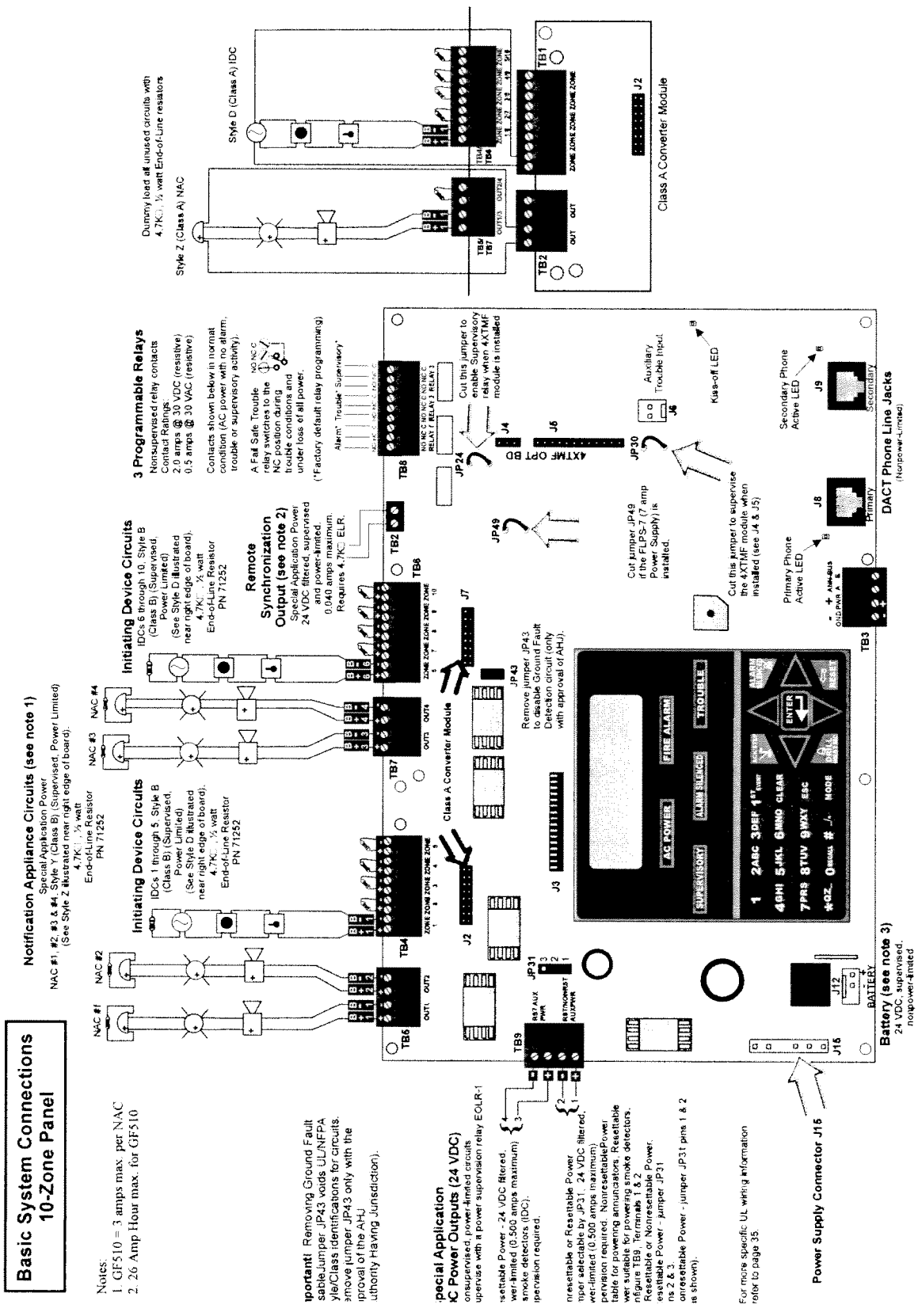
Gamewell-FCI Device Compatibility Document	Document #52195
411UD Manual	Document #50759
411UDAC Manual	Document #51073

This product has been certified to comply with the requirements in the Standard for Control Units and Accessories for Fire Alarm Systems, UL 864, 9th Edition. Operation of this product with products not tested for UL 864, 9th Edition has not been evaluated. Such operation requires the approval of the local Authority Having Jurisdiction (AHJ).

GF505 Series Main Circuit Board



GF510 Series Main Circuit Board



SECTION 1 Product Description

The GF505 is a five zone FACP (Fire Alarm Control Panel) and the GF510 is a ten zone FACP. The information in this manual refers to both the GF505 and GF510 unless otherwise specified. The combination control and digital communicator panels provide reliable fire signaling protection for small to medium sized commercial, industrial and institutional buildings. The FACP is compatible with System Sensor's I³ detectors which are conventional smoke detectors that can transmit a maintenance trouble signal to the FACP indicating the need for cleaning and a supervisory 'freeze' signal when the ambient temperature falls below the detector rating of approximately 45° F (refer to System Sensor I³ Installation and Maintenance Instructions). In addition, the control panel is compatible with conventional input devices such as two-wire smoke detectors, four-wire smoke detectors, pull stations, waterflow devices, tamper switches and other normally-open contact devices. Refer to Gamewell-FCI Device Compatibility Document for a complete listing of compatible devices.

Outputs include four NACs (Notification Appliance Circuits), three programmable Form-C relays (factory programmed for Alarm, Trouble and Supervisory) and 24 VDC special application resettable and nonresettable power outputs. The FACP supervises all wiring, AC voltage, battery level and telephone line integrity.

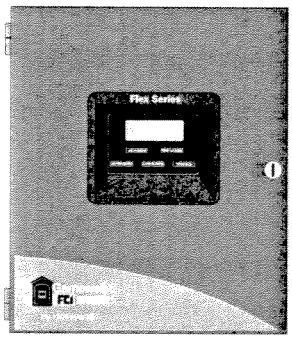
Activation of a compatible smoke detector or any normally-open fire alarm initiating device will activate audible and visual signaling devices, illuminate an indicating LED, display alarm information on the panel's LCD, sound the piezo sounder at the FACP, activate the FACP alarm relay and operate an optional module used to notify a remote station or initiate an auxiliary control function.

The following versions of the GF505/GF510 are available:

FACP Version	Description
GF505	Five Zone Panel: 120 VAC with FLPS-7 power supply providing 7.0 amps total 24 VDC output current
GF510	Ten Zone Panel: 120 VAC with FLPS-7 power supply providing 7.0 amps total 24 VDC output current

Note: Unless otherwise specified, the information in this manual applies to all versions of the panels.

1.1 Product Features



- Built-in DACT (Digital Alarm Communicator/Transmitter)
- Style B (Class B) IDC (Initiating Device Circuit)
  - ✓ GF505 - five programmable IDCs
  - ✓ GF510 - ten programmable IDCs
- Four Style Y (Class B) NAC (Notification Appliance Circuit) - special application power
- Three programmable Form-C relays
- Built-in Programmer
- Touchtone/Rotary dialing
- Programmable Make/Break Ratio
- Optional Dress Panel DP-51050 (red) or DP-51050W (white)
- Optional Dress Panel DP-51050LED or DP-51050LEDW (white): includes a GFANN-LED Annunciator module
- Optional Trim Ring TR-CE (red) or TR-CEW (white) for semi-flush mounting the cabinet
- ANN-BUS for connection to optional:

  - ✓ GFANN-80 Remote LCD Annunciator
  - ✓ GFANN-I/O LED Driver
  - ✓ GFANN-S/PG Printer Module
  - ✓ GFANN-RLY Relay Module
  - ✓ GFANN-LED Annunciator Module
- 80-character LCD display (backlit)
- Real-time clock/calendar with daylight savings time control
- History log with 256 event storage
- Control Buttons
  - ✓ ACK (Acknowledge)
  - ✓ Alarm Silence
  - ✓ System Reset/Lamp Test
  - ✓ Drill
- LED Indicators
  - ✓ Fire Alarm
  - ✓ Supervisory
  - ✓ Trouble
  - ✓ AC Power
  - ✓ Alarm Silence
  - ✓ Primary and Secondary Phone Line Active LEDs
- Piezo sounder for alarm, trouble and supervisory
- 24 volt operation
- Low AC voltage sense
- Alarm Verification
- NACs Programmable for:
  - ✓ Silence Inhibit
  - ✓ Auto-Silence
  - ✓ Strobe Synchronization (System Sensor, Wheelock, Gentex, Faraday, Amseco)
  - ✓ Selective Silence (horn-strobe mute)
  - ✓ Temporal or Steady Signal
  - ✓ Silenceable or Nonsilenceable
- Automatic battery charger with charger supervision
- Silent or audible walktest capabilities
- Optional CAC-5X Class A Converter Module for NACs and IDCs
- Optional 4XTMF Transmitter Module

1.2 Specifications

AC Power

GF505 & GF510 (FLPS-7 Power Supply): 120 VAC, 60 HZ, 3.80 amps
Wire size: minimum #14 AWG (2.0 mm^2) with 600V insulation
Supervised, nonpower-limited

Battery (sealed lead acid only) - J12

Maximum Charging Circuit - Normal Flat Charge: 27.6 VDC @ 1.4 amp
Supervised, nonpower-limited
Maximum Charger Capacity: 26 Amp Hour battery for GF505 & GF510 [two 18 Amp Hour batteries can be housed in the FACP cabinet.]
Minimum Battery Size: 7 Amp Hour

Initiating Device Circuits - TB4 (and TB6 on GF510 only)

Alarm Zones 1 - 5 on TB 4 (GF505)

Alarm Zones 6 - 10 on TB6 (GF510 only)
Supervised and power-limited circuitry
Operation: All zones Style B (Class B)
Normal Operating Voltage: Nominal 20 VDC
Alarm Current: 15 mA minimum
Short Circuit Current: 40 mA max.
Maximum Loop Resistance: 100 ohms
End-of-Line Resistor: 4.7KΩ, 1/2 watt (Part #71252)
Standby Current: 2 mA
Refer to Gamewell-FCI Device Compatibility Document for listed compatible devices

Notification Appliance Circuit(s) - TB5 and TB7[1]

Four NACs
Operation: Style Y (Class B)
Special Application power
Supervised and power-limited circuitry
Normal Operating Voltage: Nominal 24 VDC
Maximum Signaling Current: 7.0 amps for GF505 & GF510 (3.0 amps maximum per NAC)
End-of-Line Resistor: 4.7KΩ, 1/2 watt (Part #71252)
Max. Wiring Voltage Drop: 2 VDC
Refer to Gamewell-FCI Device Compatibility Document for compatible listed devices

1. Total current for resettable power, nonresettable power and Notification Appliance Circuits must not exceed 7.0 amps.

Form-C Relays - Programmable - TB8

Relay 1 (factory default programmed as Alarm Relay)
Relay 2 (factory default programmed as fail-safe Trouble Relay)
Relay 3 (factory default programmed as Supervisory Relay)
Relay Contact Ratings: 2 amps @ 30 VDC (resistive), 0.5 amps @ 30 VAC (resistive)

Special Application Resettable Power - TB9

Operating Voltage: Nominal 24 VDC
Maximum Available Current: 500 mA - appropriate for powering 4-wire smoke detectors (see note 1)
Power-limited Circuitry
Refer to Gamewell-FCI Device Compatibility Document for compatible listed devices

Special Application Resettable or Nonresettable Power - TB9

Operating Voltage: Nominal 24 VDC
Maximum Available Current: 500 mA (see note 1)
Power-limited Circuitry
Jumper selectable by JP31 for resettable or nonresettable power:

- ✓ Jumper pins 1 & 2 on JP31 for nonresettable power
- ✓ Jumper pins 2 & 3 on JP31 for resettable power

Refer to Gamewell-FCI Device Compatibility Document for compatible listed devices

Remote Sync Output - TB2

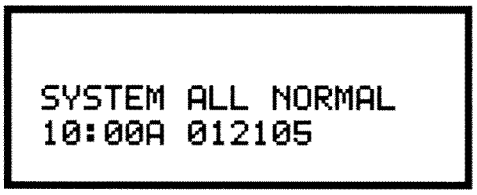
24 VDC nominal special application power
Maximum current is 40 mA
End-of-Line Resistor: 4.7KΩ
Supervised and power-limited circuit

Auxiliary Trouble Input - J6

The Auxiliary Trouble Input is an open collector circuit which can be used to monitor an external device for trouble conditions. It can be connected to the trouble bus of a peripheral, such as a power supply, which is compatible with open collector circuits.
All connections must be in conduit, less than 20 ft. (610 cm) in length in the same room.

1.3 Controls and Indicators

LCD Display
The FACP uses an 80-character (4 lines X 20 characters) high viewing angle LCD display. The display includes a long life LED backlight that remains illuminated. If AC power is lost and the system is not in alarm, the LED backlight will turn off to conserve batteries.



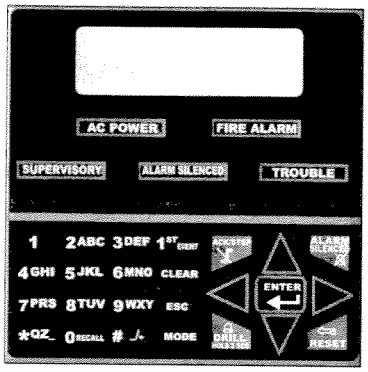
Key Panel
Mounted on the main circuit board, the key panel includes a window for the LCD display and LED indicators as listed above. The key panel, which is visible with the cabinet door closed, has 25 keys, including a 16 key alpha-numeric pad similar to a telephone keypad.

Function keys:

- Acknowledge/Step
- Alarm Silence
- Drill
- System Reset (lamp test)

Service/program keys:

- Keys labeled 1 to 9
- * key
- # key
- 0 (recall) key
- 1st Event key
- Clear key
- Escape key
- Mode key
- Four cursor keys (up, down, left and right)
- Enter key



90/50/udkypd.cdr

Figure 1.1 Membrane/Display Panel

LED Indicators

LEDs are provided to annunciate the following conditions:

- Fire Alarm - red LED
- Supervisory - yellow LED
- AC Power - green LED
- System Trouble - yellow LED
- Alarm Silence - yellow LED
- Primary Phone Line Active (on circuit board) - red LED
- Secondary Phone Line Active (on circuit board) - red LED

Local Piezo Sounder

A piezo sounder provides separate and distinct sounds for alarm, trouble, maintenance, process monitor and supervisory conditions as follows:

- Alarm - on steady
- Trouble - pulse 1 second on and 1 second off
- Maintenance - pulse ½ second on and ½ second off
- Supervisory - pulse ½ second on and ½ second off
- Process Monitor - pulse ¼ second on and ¼ second off

1.4 Digital Alarm Communicator/Transmitter

Two modular phone jacks allow easy connection to telephone lines. Modular jacks are labeled PH1 for Primary Phone Line and PH2 for Secondary Phone Line. Two telephone line active red LEDs are provided as well as a green *Kissoff* LED. The integral digital communicator provides the following functions:

- Line Seizure: takes control of the phone lines disconnecting any premises phones
- Off/On Hook: performs on and off-hook status to the phone lines
- Listen for dial tone: 440 Hz tone typical in most networks
- Dialing the Central Station(s) number: default is Touch-Tone®, programmable to rotary
- For tone burst or touchtone type formats: discern proper *Ack* and *Kissoff* tone(s). The frequency and time duration of the tone(s) varies with the transmission format. The control panel will adjust accordingly.
- Communicate in the following formats:
  - ✓ Ademco Contact ID
  - ✓ SIA-DCS-8
  - ✓ SIA-DCS-20

1.5 Components

Main Circuit Board
The main circuit board contains the system's CPU, DACT and other primary components and wiring interface connectors. Optional modules plug in and are mounted to the main circuit board.

Power Supply
One power supply is provided standard with each FACP, mounted to a chassis.

- FLPS-7 for the GF505 & GF510

Cabinet
The backbox measures 16.65" (42.29 cm) x 19.0" (48.26 cm) x 5.207" (13.23 cm) and provides space for two batteries (up to 18 Amp Hours). Also available are an optional dress panel (DP-51050/W) which mounts inside the cabinet and trim-ring (TR-CE/W).

Batteries
The cabinet provides space for two 18 Amp Hour batteries. Batteries must be ordered separately.

1.6 Optional Modules and Accessories

CAC-5X Class A Converter Module

The CAC-5X Module can be used to convert the Style B (Class B) Initiating Device Circuits to Style D (Class A) and Style Y (Class B) Notification Appliance Circuits to Style Z (Class A). The module connects to J2 on the GF505 and to J7 on the GF510. Note that two Class A Converter modules are required for the 10 zone panel.

4XTMF Transmitter Module

The 4XTMF provides a supervised output for local energy municipal box transmitter and alarm and trouble reverse polarity. It includes a disable switch and disable trouble LED. A module jumper option allows the reverse polarity circuit to open with a system trouble condition if no alarm condition exists. The 4XTMF mounts to the main circuit board connectors J4 & J5.

GFANN-80 LCD Annunciator

The GFANN-80 is a remote LCD annunciator which mimics the information displayed on the

FACP LCD display.

GFANN-LED Annunciator Module

The GFANN-LED Annunciator Module mounts in the DP-51050LED/W Dress Panel and provides three LEDs for each zone: Alarm, Trouble and Supervisory.

GFANN-RLY Relay Module

The GFANN-RLY Module, which can be mounted inside the cabinet, provides 10 Form-C relays.

GFANN-S/PG Serial/Parallel Printer Gateway

The GFANN-S/PG module provides a connection for a serial or parallel printer.

GFANN-I/O LED Driver Module

The GFANN-I/O module provides connections to a user supplied graphic annunciator.

DP-51050/W Dress Panel

A dress panel DP-51050 (red) or DP-51050W (white) is available as an option. The dress panel restricts access to the system wiring while allowing access to the membrane switch panel.

TR-CE/W Trim-ring

A trim-ring TR-CE (red) or TR-CEW (white) is available as an option. The trim-ring allows semi-flush mounting of the cabinet.

Battery Box

The battery box may be used to house two batteries greater than 18 Amp Hour. The battery box mounts directly below the control panel cabinet, centered to the main circuit board.

1.7 Telephone Requirements and Warnings

1.7.1 Telephone Circuitry

Ringer Equivalence Number (REN) = 0.0B

AC Impedance: 10.0 Mega Ohm

Complies with FCC Part 68

Mates with RJ31X Male Connector

Supervision Threshold: loss of phone line voltage for 2 minutes

The REN is used to determine the quantity of devices which may be connected to the telephone line. Excessive RENs on the telephone line may result in the devices not ringing in response to an incoming call. In most, but not all areas, the sum of the RENs should not exceed five (5.0). To be certain of the number of devices that may be connected to the line as determined by the total RENs, contact the telephone company to determine the maximum REN for the calling area.

1.7.2 Digital Communicator

Before connecting the control panel to the public switched telephone network, the installation of two RJ31X jacks is necessary. If trouble is experienced with this equipment, for repair or warranty information, please contact:

Manufacturer: Gamewell-FCI
12 Clintonville Road
Northford, CT 06472
(203) 484-7161

Product Model Number: **GF505/GF510**
FCC Registration Number: **1W6AL00B10UD**
Ringer Equivalence: **0.0B**

Important! *The DACT must not be used to dial a phone number that is call-forwarded.*

Note: This equipment complies with Part 68 of the FCC rules and the requirements adopted by the ACTA. On the inside of the FACP door is a label that contains, among other information, a product identifier in the format **US:AAAEQ##TXXXX**. If requested, this number must be provided to the telephone company.

Alarm dialing equipment must be able to seize the telephone line and place a call in an emergency situation. It must be able to do this even if other equipment (telephone, answering system, computer modem, etc.) already has the telephone line in use. To do so, alarm dialing equipment must be connected to a properly installed RJ31X jack that is electrically in series with and ahead of all other equipment attached to the same telephone line. If there are any questions concerning these instructions, consult the telephone company or a qualified installer about installing the RJ31X jack and alarm dialing equipment. Refer to "Digital Communicator" on page 31 for an illustration of the proper installation of this equipment.

1.7.3 Telephone Company Rights and Warnings

The telephone company, under certain circumstances, may temporarily discontinue services and/or make changes in its facilities, services, equipment or procedures which may affect the operation of this control panel. However, the telephone company is required to give advance notice of such changes or interruptions.

If the control panel causes harm to the telephone network, the telephone company reserves the right to temporarily discontinue service. Advance notification will be provided except in cases when advance notice is not practical. In such cases, notification will be provided as soon as possible. The opportunity will be given to correct any problems and to file a complaint with the FCC if you believe it is necessary.

DO NOT CONNECT THIS PRODUCT TO COIN TELEPHONE, GROUND START, OR PARTY LINE SERVICES.

When the control panel activates, premise phones will be disconnected.

Two separate phone lines are required. Do not connect both telephone interfaces to the same telephone line.

The control panel must be connected to the public switched telephone network upstream (as first device) of any private telephone system at the protected premises.

A plug and jack used to connect this equipment to the premises wiring and telephone network must comply with the applicable FCC Part 68 rules and requirements adopted by ACTA. This equipment is designed to be connected to the telephone network or premises wiring using a compliant RJ31X male modular plug and compatible modular jack that is also compliant.

SECTION 2 Installation

The cabinet can be surface mounted or semi-flush mounted. The door is removable during the installation period by opening and lifting if off the hinges. The cabinet mounts using two key slots at the top of the backbox and two additional securing holes located at the bottom.

Carefully unpack the system and check for shipping damage. Mount the cabinet in a clean, dry, vibration-free area where extreme temperatures are not encountered. The area should be readily accessible with sufficient room to easily install and maintain the panel. Locate the top of the cabinet approximately 5 feet (1.5 m) above the floor with the hinge mounting on the left. Determine the number of conductors required for the devices to be installed. Sufficient knockouts are provided for wiring convenience. Select the appropriate knockout(s) and pull the conductors into the box. All wiring should be in accordance with the National and/or Local codes for fire alarm systems.

2.1 Backbox Mounting

⚠ *The circuit board contains static-sensitive components. Always ground yourself with a proper wrist strap before handling any boards so that static charges are removed from the body. Use static suppressive packaging to protect electronic assemblies.*

To prevent damage to the circuit board and to facilitate backbox mounting, the chassis with main circuit board and transformer can be easily removed. Loosen the two 3/8" nuts securing the top flanges of the chassis, then slide the chassis up to free it from the lower tabs. Place the chassis assembly in a protective antistatic bag in a safe location until it can be reinstalled in the backbox.

See Page

- ✓ Mark and predrill hole in the wall for the center top keyhole mounting bolt using the dimensions illustrated in Figure 2.2 on page 22
- ✓ Install center top fastener in the wall with the screw head protruding
- ✓ Place backbox over the top screw, level and secure
- ✓ Mark and drill the left and right upper and lower mounting holes
  Note: outer holes (closest to sidewall) are used for 16" O.C. stud mounting
- ✓ Install remaining fasteners and tighten

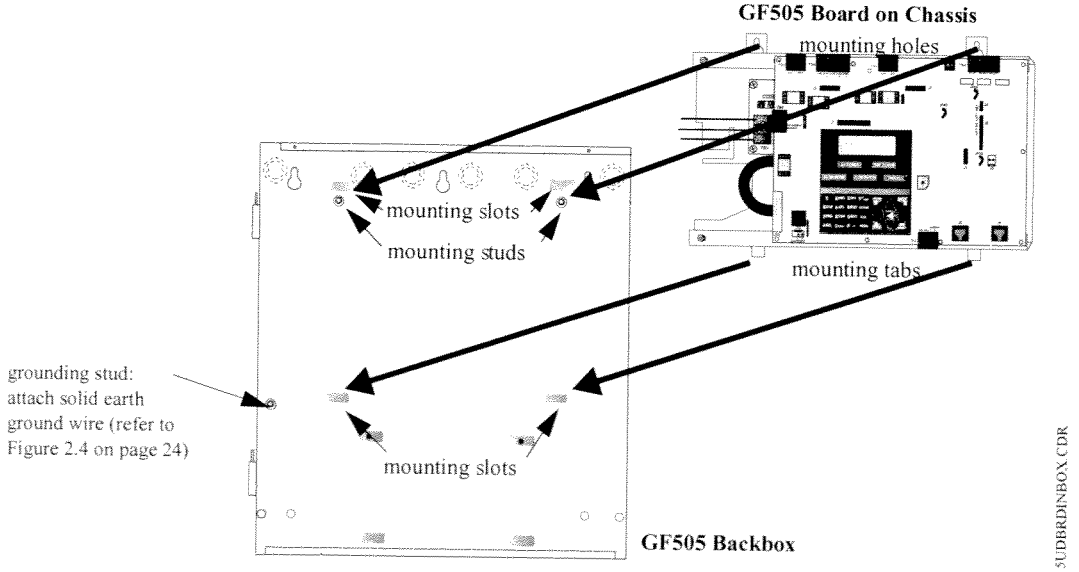


Figure 2.1 Chassis Mounting in Backbox

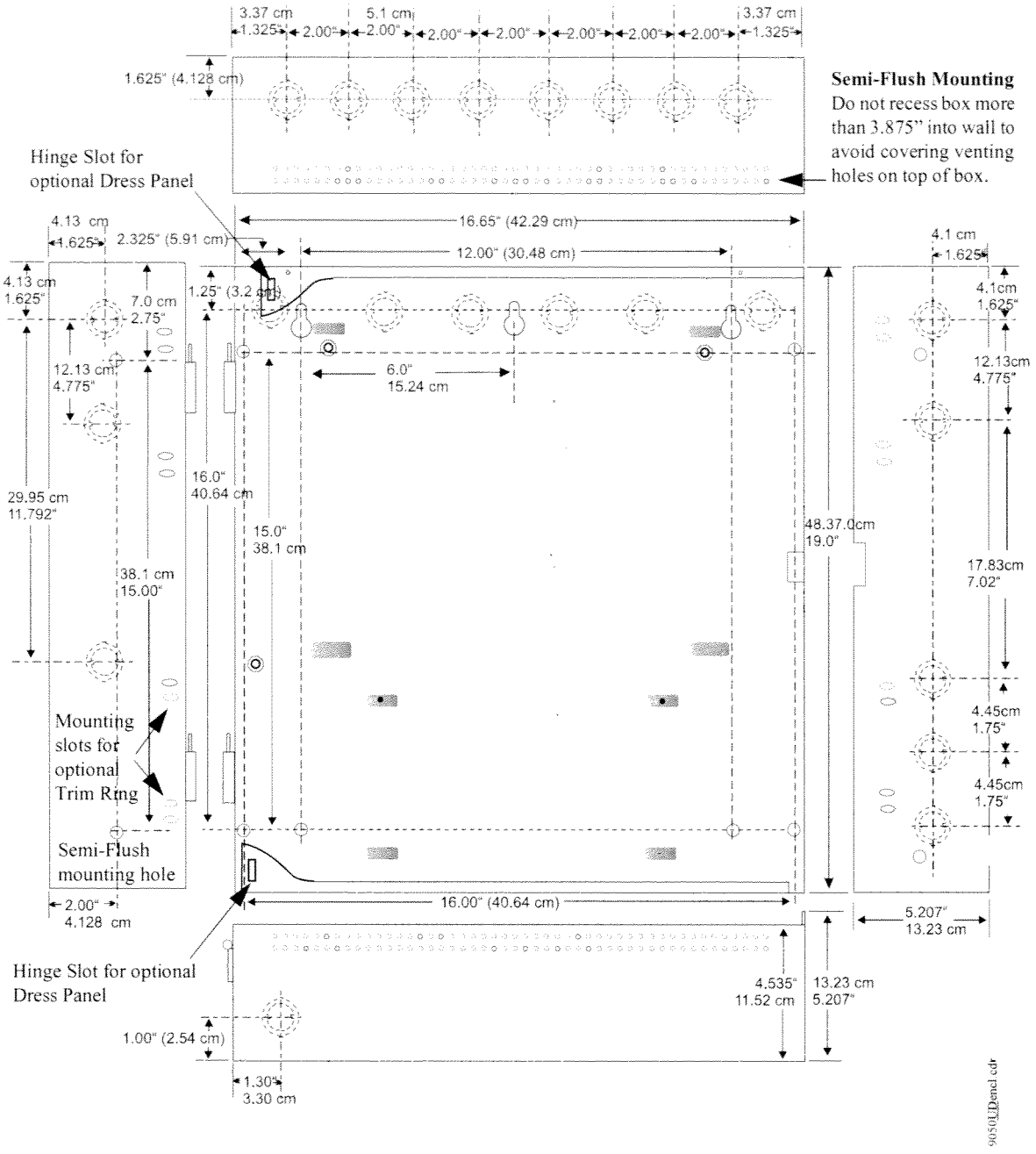


Figure 2.2 Cabinet Dimensions

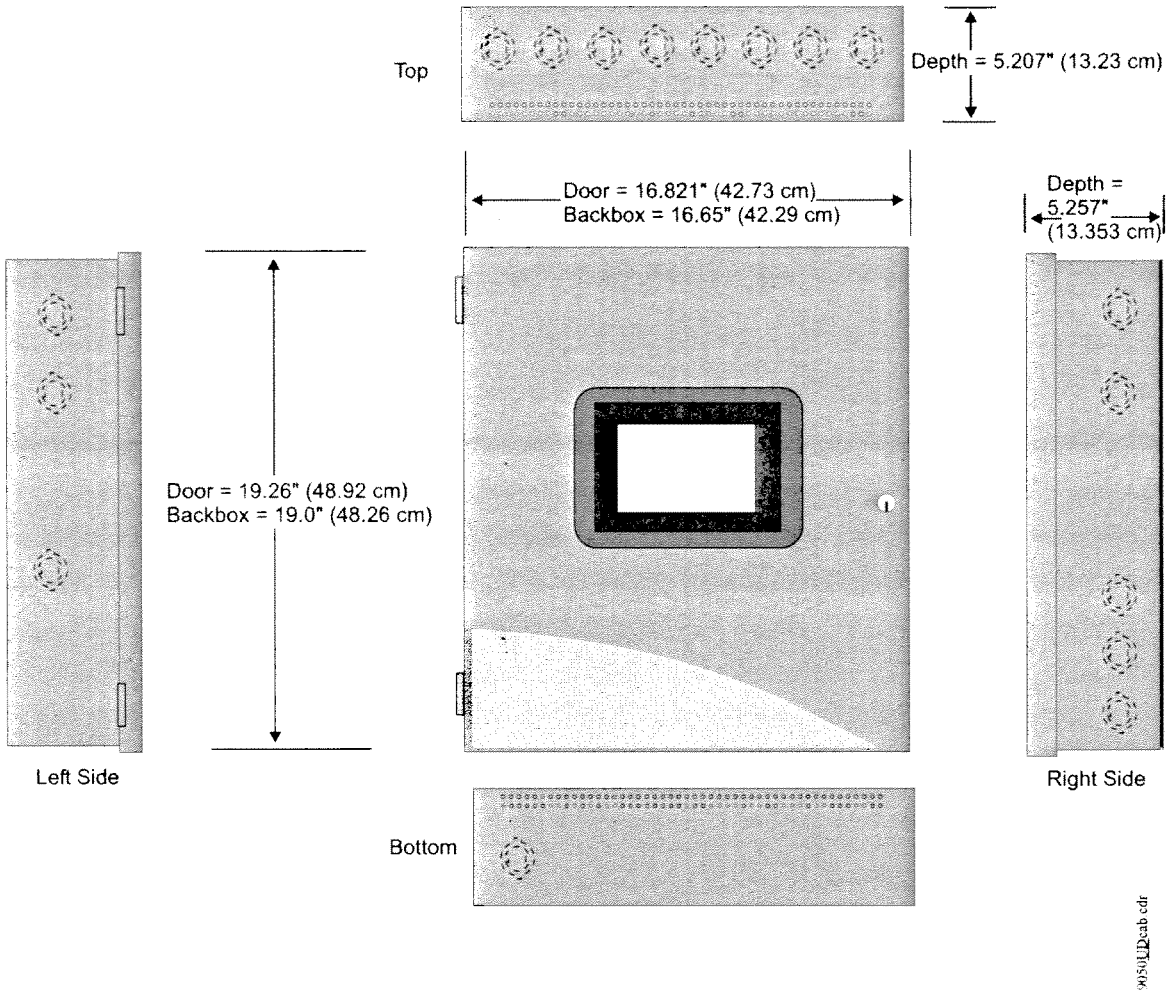


Figure 2.3 Backbox and Battery Box

2.2 Operating Power

WARNING: Several different sources of power can be connected to this panel. Disconnect all sources of power before servicing. The panel and associated equipment may be damaged by removing and/or inserting cards, modules or interconnecting cables while this unit is energized.

Primary Power Source (AC) and Earth Ground Connections

AC power connections are made inside the control panel cabinet. Refer to **AC Power** in the section titled "Specifications" on page 13, for power and current requirements for each FACP version. Run a pair of wires (with ground conductor) from the protected premises main breaker box to the AC terminal block TB1 on the main power supply. As per the National Electrical Code, use 14 AWG (2.00 mm², 1.6 mm O.D.) or heavier gauge wire with 600V insulation. No other equipment may be connected to this circuit. In addition, this circuit must be provided with overcurrent protection and may not contain any power disconnect devices. A separate Earth Ground connection must be made to ensure proper panel operation and lightning and transient protection. Connect the Earth Ground wire [minimum 14 AWG (2.00 mm²)] to the grounding stud in the backbox. *Do not use conduit for the Earth Ground connection since this does not provide reliable protection.*

Secondary Power Source (Batteries)

Observe polarity when connecting the battery. Connect the battery cable to J12 on the main circuit board using the plug-in connector and cable provided. The battery charger is current-limited and capable of charging sealed lead acid batteries. The charger shuts off when the system is in alarm.

WARNING: Battery contains sulfuric acid which can cause severe burns to the skin and eyes and can destroy fabrics. If contact is made with sulfuric acid, immediately flush the skin or eyes with water for 15 minutes and seek immediate medical attention.

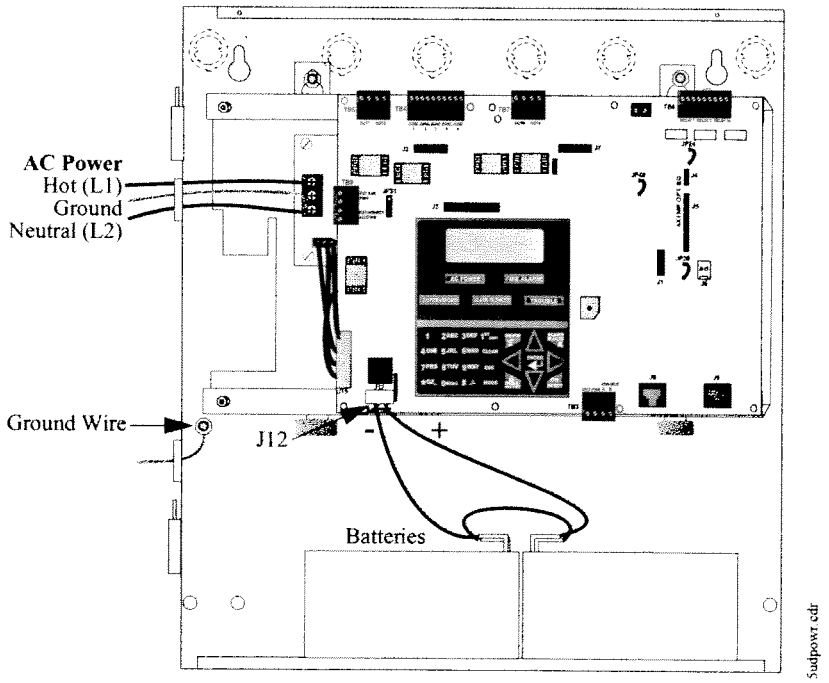


Figure 2.4 Operating Power Connections

2.3 Input Circuits

The GF505 has five IDCs (Initiating Device Circuits) and the GF510 has ten IDCs. Each circuit is compatible with System Sensor's I³ smoke detectors which generate a maintenance signal when the detector becomes dirty and a separate supervisory 'freeze' signal when ambient temperature falls below the detector rating of approximately 45°F. The maximum loop resistance limit for each IDC is 100 ohms. The maximum number of detectors per zone is 25. The field wiring for each zone is supervised for opens, shorts and ground faults. All conditions are visually and audibly annunciated.

Each circuit is configured for Style B (Class B) operation and will accept I³ smoke detectors, any normally-open contact devices as well as conventional 2-wire or 4-wire, 24 VDC smoke detectors. Refer to the Gamewell-FCI Device Compatibility Document for a list of compatible devices.

Initiating Device Circuits can be converted to Style D (Class A) by installing the optional Class A Converter module. Refer to "CAC-5X Class A Converter Module" on page 32.

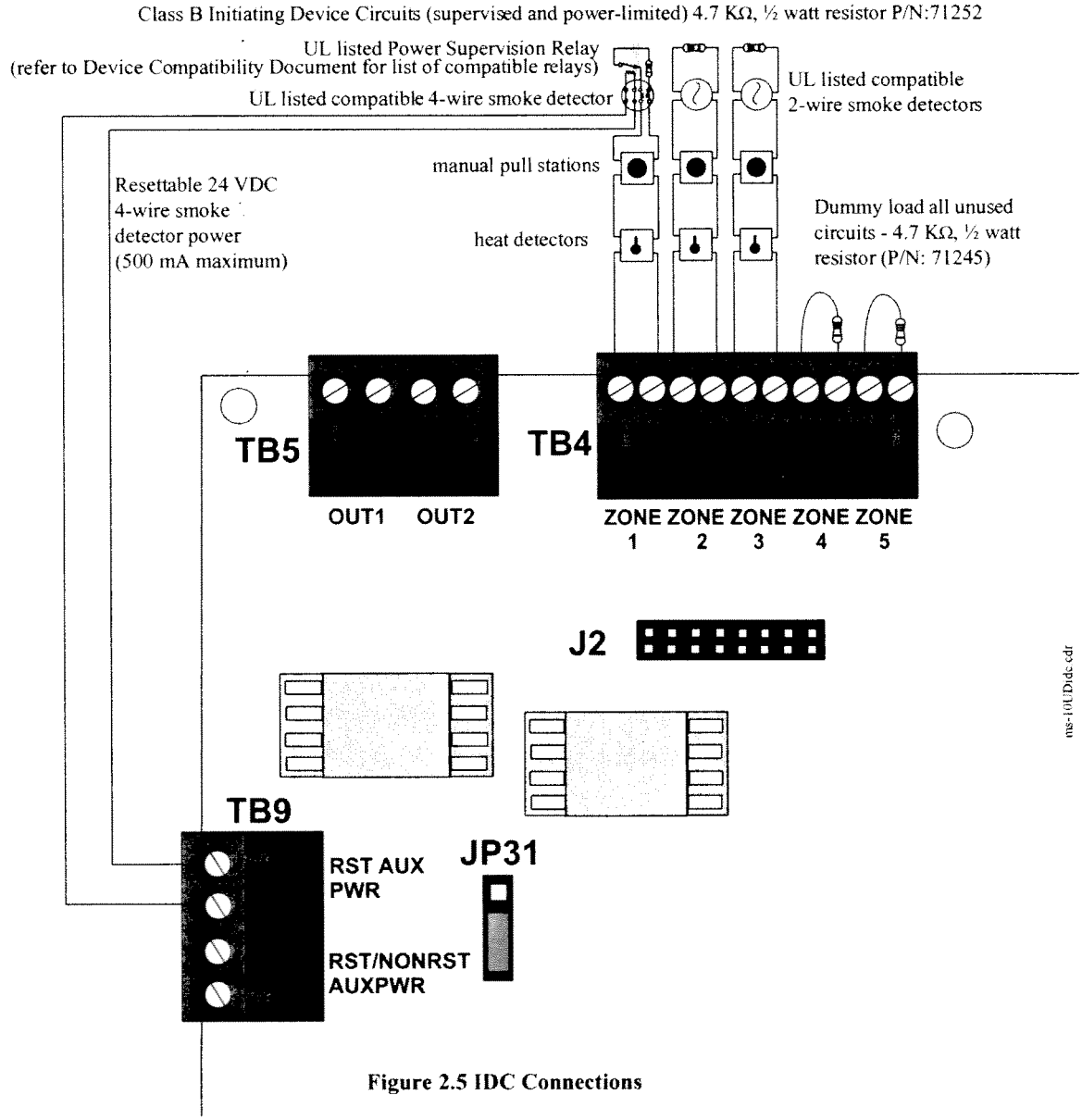


Figure 2.5 IDC Connections

Combination Waterflow/Supervisory Zone

A combination Waterflow/Supervisory circuit allows an FACP to distinguish between an Alarm switch (waterflow device) and a Supervisory switch (tamper) installed on the same circuit. Any circuit can be programmed as a Combo Type zone. The following figure illustrates the wiring of Zone 2 as a Style B (Class B) Waterflow/Supervisory circuit.

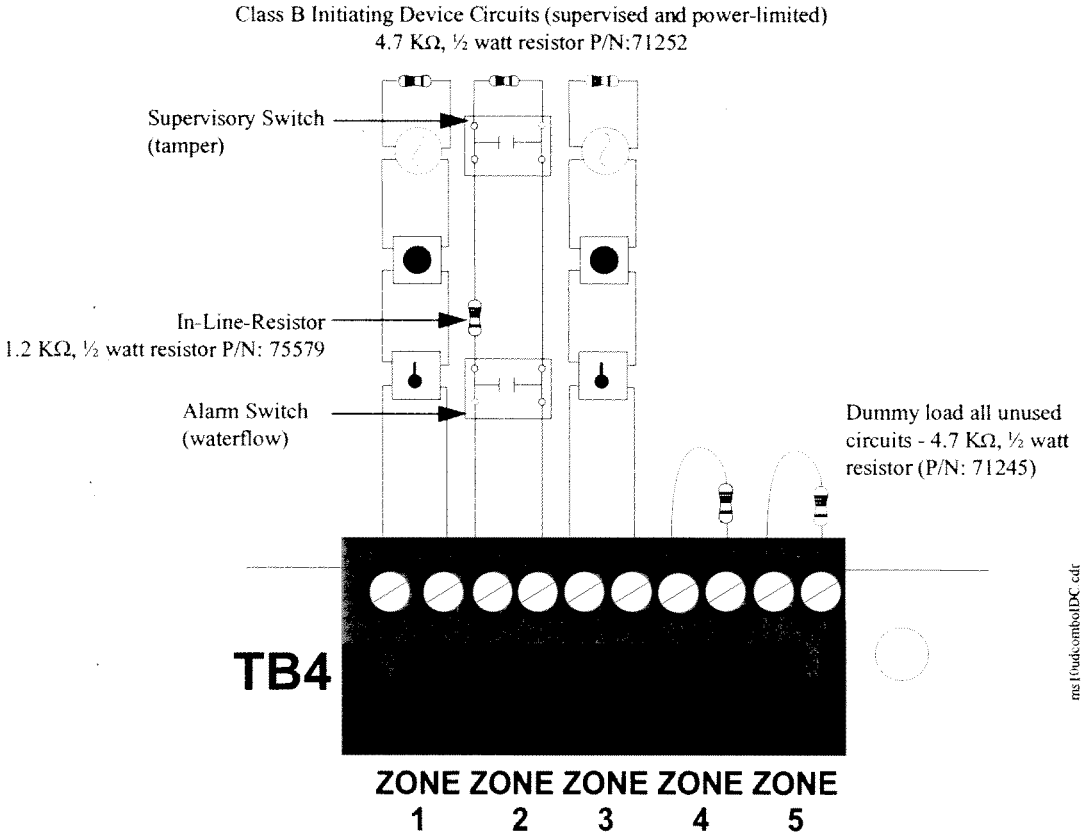


Figure 2.6 Style B Combination Circuit on Zone 2

Requirements for the Combination Waterflow/Supervisory circuit are as follows:

- ✓ The Waterflow Alarm Switch must connect to the FACP Initiating Device Circuit before the In-Line Resistor as shown in Figure 2.6
- ✓ The Waterflow Supervisory Switch must connect to the FACP Initiating Device Circuit after the In-Line Resistor as shown in Figure 2.6
- ✓ Program the FACP Initiating Device Circuit as a Combination circuit as described in "Input Zones" on page 56. *Note that since a Waterflow Supervisory Switch is included in a Combination circuit, the waterflow delay must be taken into consideration. Refer to "Waterflow Delay" on page 71.*
- ✓ Waterflow Alarm Switch activation causes the panel to latch into alarm until the alarm condition is cleared and the FACP is reset
- ✓ Supervisory Switch activation causes the panel to latch the supervisory condition if the Combo type code is selected or track (the panel will clear when the supervisory condition is cleared) if the Combo Autoresettable Supervisory type code is selected

2.4 Output Circuits

2.4.1 Notification Appliance Circuits

Each of the four Style Y (Class B) Notification Appliance Circuits can output a maximum of 3.0 amps of current. Total current drawn from these as well as other DC power outputs cannot exceed 7.0 amps for the GF505 & GF510 [3.0 amps maximum per NAC] powered by the FLPS-7 power supply (refer to "Power Supply Calculations" on page 122). Each circuit is supervised, power-limited and provides special application power. Refer to the Gamewell-FCI Device Compatibility Document for a listing of compatible notification appliances.

The NACs can be converted to Style Z (Class A) by installing the optional Class A Converter module. Refer to "CAC-5X Class A Converter Module" on page 32.

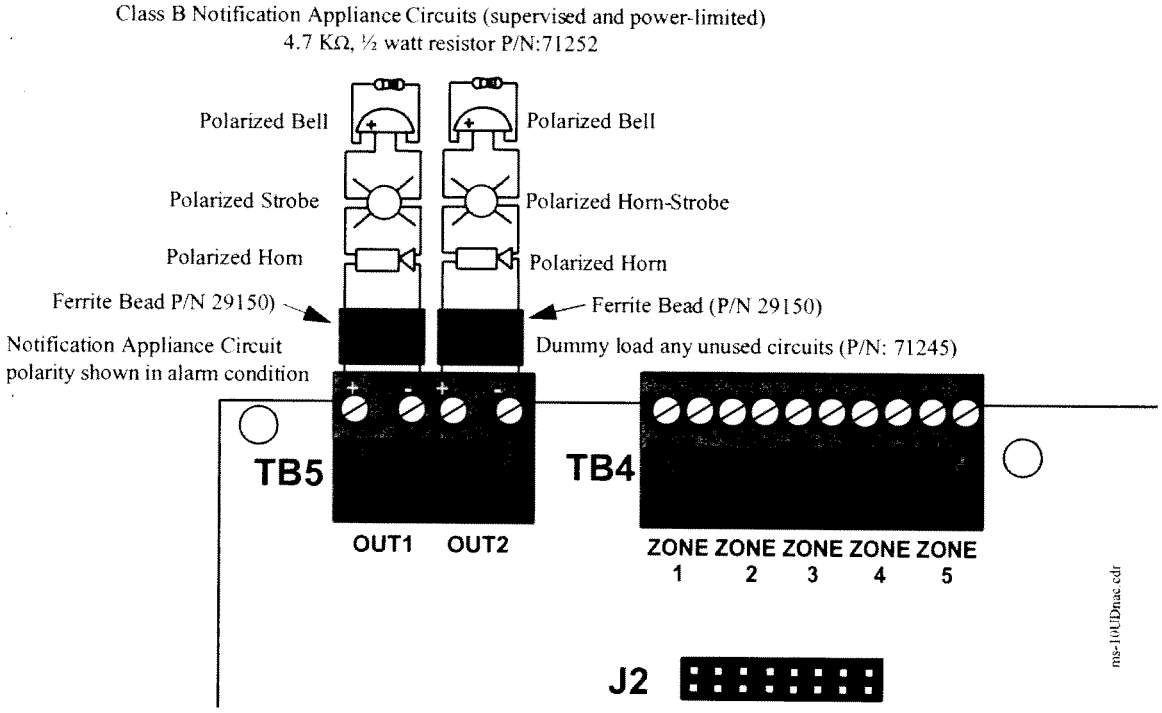
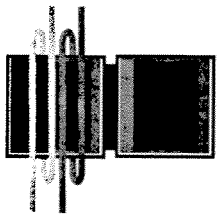


Figure 2.7 NAC Connections

Large gauge wire should be looped through bead at least once as illustrated. Smaller gauge wire can be looped more often.



Ferrite Bead in open position

Ferrite Bead in closed position

2.4.2 Special Application DC Power Output Connections

Special Application Resettable and Nonresettable 24 VDC power is available on the GF505/ GF510 control panel.

Special Application
4-Wire Smoke Detector Power (500 mA)
24 VDC filtered, resettable power for 4-wire smoke detectors can be obtained from these terminals (power-limited)

Special Application
Resettable or Nonresettable Power (500 mA)
24 VDC filtered, resettable or nonresettable power can be obtained from these terminals (power-limited)

- Jumper JP31 pins 1 & 2 for nonresettable power (as illustrated in figure to right)
- Jumper JP31 pins 2 & 3 for resettable power

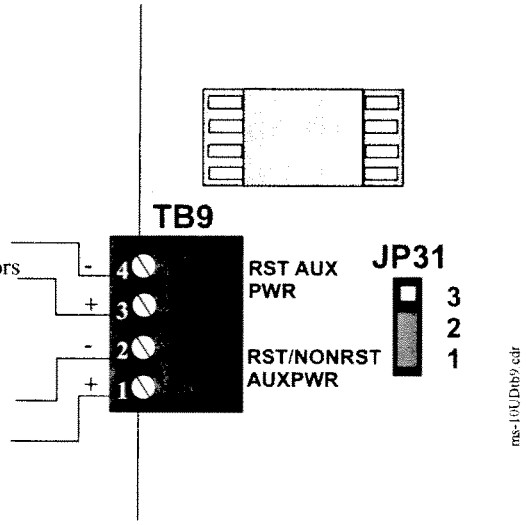


Figure 2.8 Special Application Auxiliary Power

2.4.3 Relays - Programmable

The GF505/GF510 control panels provide a factory default programmed alarm relay, fail-safe trouble relay and supervisory relay. Each relay can be programmed to activate for other conditions (refer to "Relays" on page 67). Each Form-C relay is rated for 2 amps @ 30VDC (resistive) and 0.5 amps @ 30 VAC (resistive).

Note that relay connections must be power-limited.

Note: Relay contacts are shown with power applied to the panel and no active troubles, alarms or supervisories. The Trouble Relay is a fail-safe relay which will transfer on any trouble or total power failure.

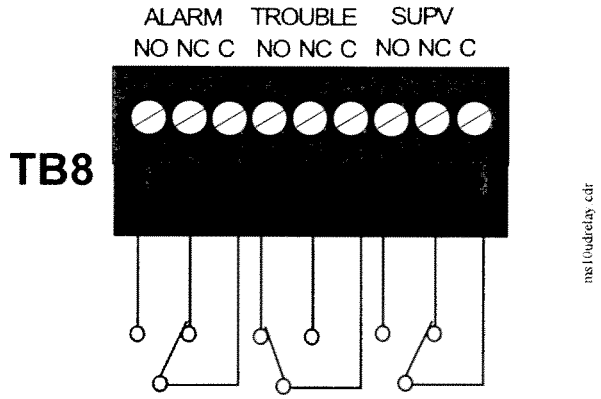


Figure 2.9 Relay Terminals

2.4.4 Remote Synchronization Output

Synchronization is a feature that controls the activation of notification appliances in such a way that all devices will turn on and off at exactly the same time. This is particularly critical when activating strobes which must be synchronized to avoid random activation and a potential hazard to individuals. Devices connected directly to the control panel's NAC can be synchronized as described in "Synchronized NAC Operation" on page 65.

Notification appliances connected to remote power sources may require synchronization with the FACP's devices. For the GF505 & GF510, the Remote Sync Output is not required. Synchronization for remote power supplies is provided directly from NAC1 (Out 1). Note that NAC 1 (Out 1) must be programmed for sync operation when used for this purpose.

The Remote Synchronization Output is power-limited and supervised and requires a 4.7KΩ ELR resistor at the remote power supply end of the wiring.

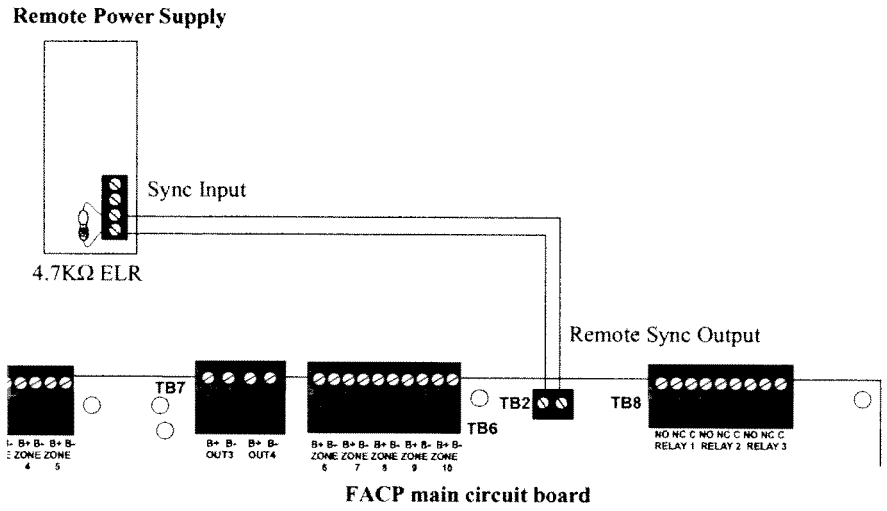


Figure 2.10 Remote Sync Output

2.5 Power-limited Wiring Requirements

Power-limited and nonpower-limited circuit wiring must remain separated in the cabinet. All power-limited circuit wiring must remain at least 0.25" (6.35 mm) away from any nonpower-limited circuit wiring. Furthermore, all power-limited and nonpower-limited circuit wiring must enter and exit the cabinet through different knockouts and/or conduits. A typical wiring diagram is illustrated below.

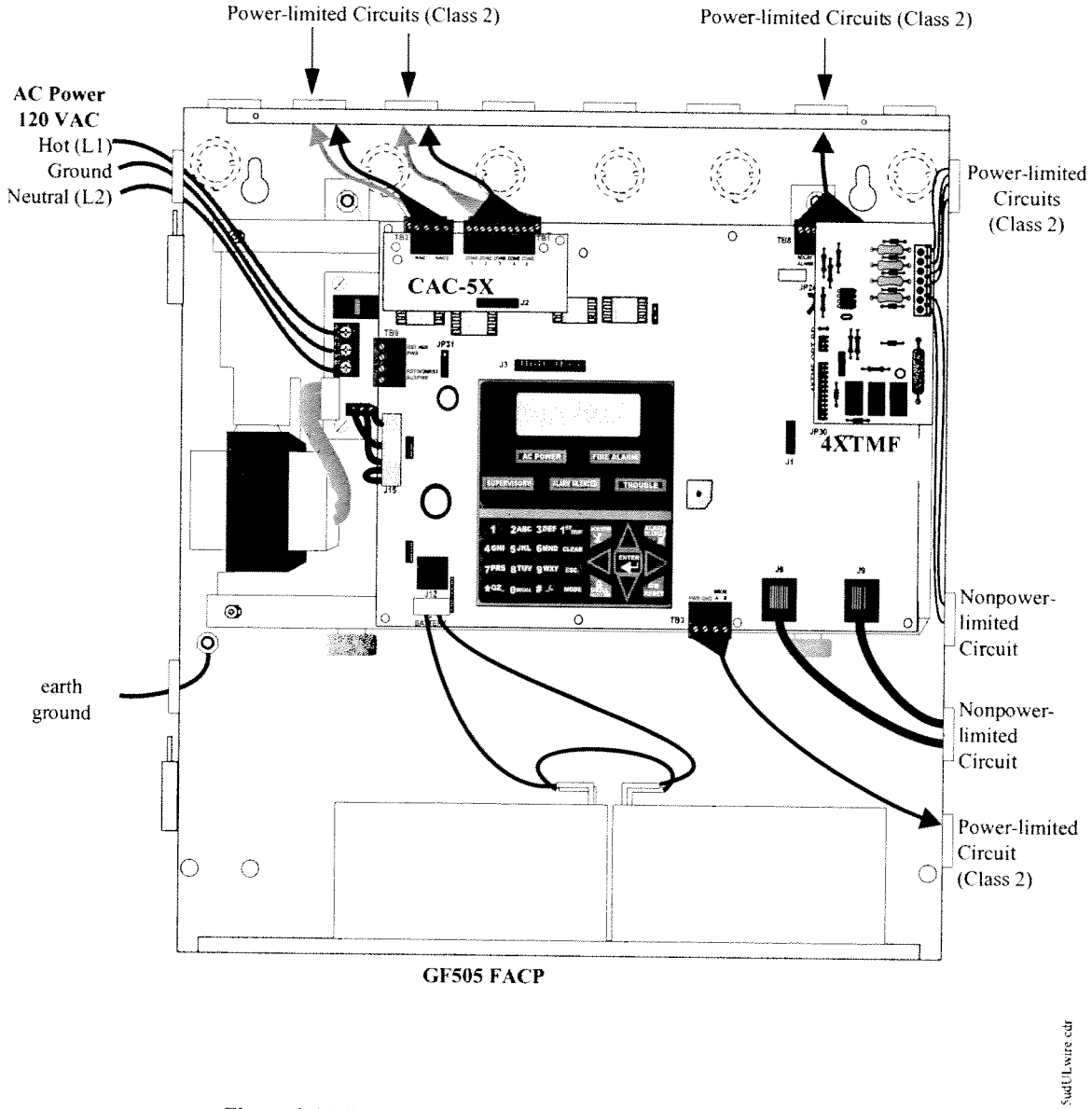


Figure 2.11 Typical UL Power-limited Wiring Requirements

2.6 Digital Communicator

Two independent telephone lines can be connected to the control panel. Telephone line control/ command is made possible via double line seizure as well as usage of an RJ31X style interconnection. *Note that it is critical that the panel's digital communicator be located as the first device on the incoming telephone circuit to properly function.*

Important! *The DACT must not be used to dial a phone number that is call-forwarded.*

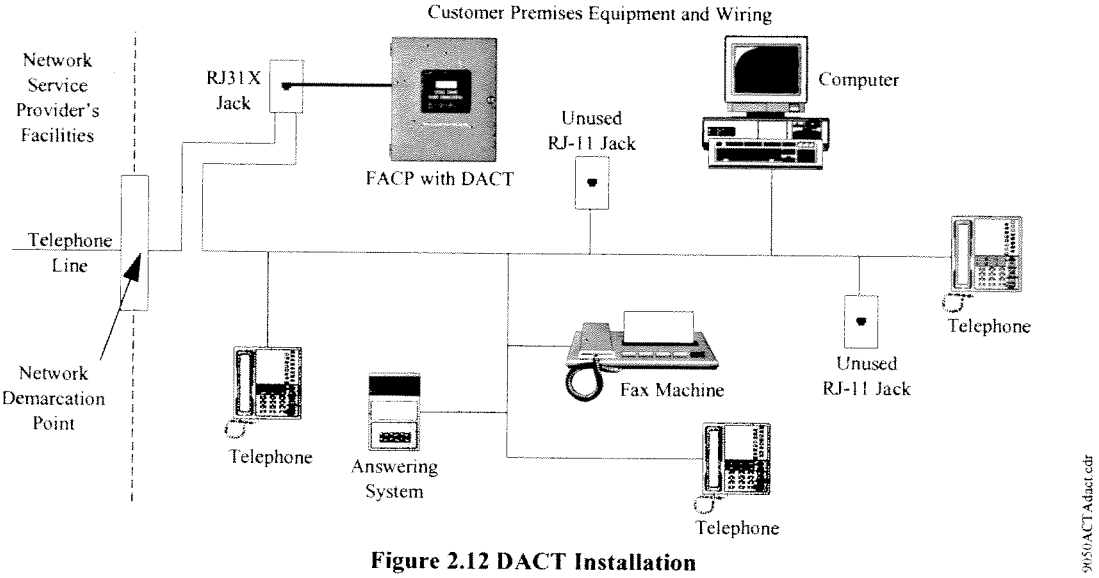


Figure 2.12 DACT Installation

The control panel's digital communicator is built into the main circuit board. Connection and wiring of two phone lines is required as shown below.

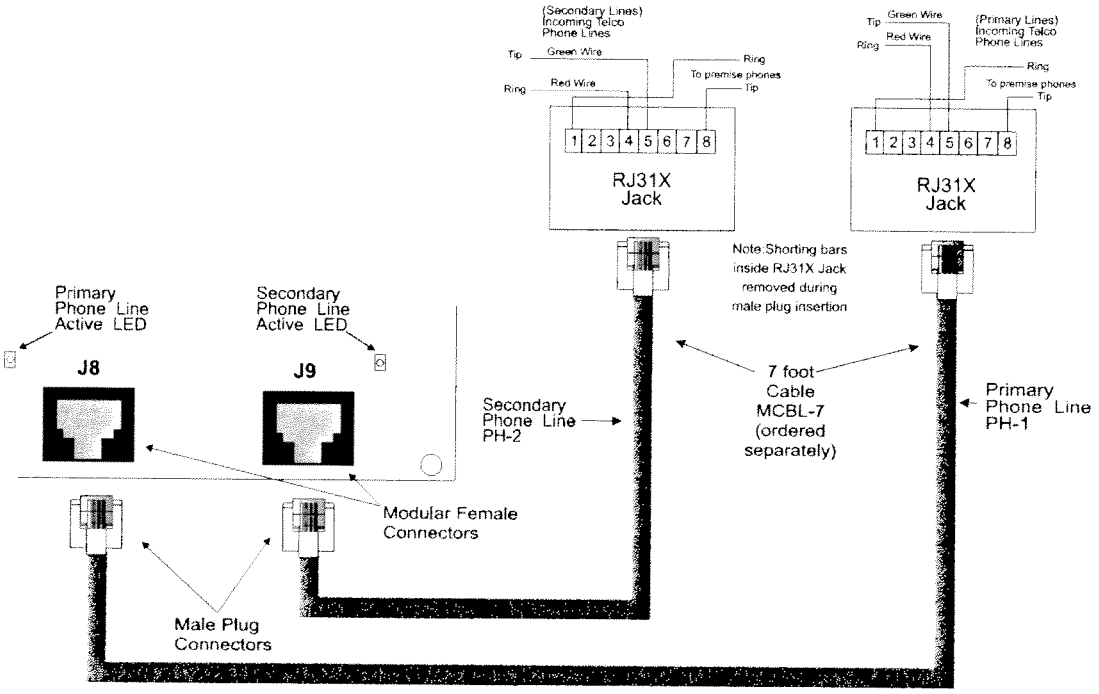


Figure 2.13 Wiring Phone Jacks

2.7 Installation of Optional Modules

CAUTION: Remove all power (AC and DC) before installing or removing modules or wiring.

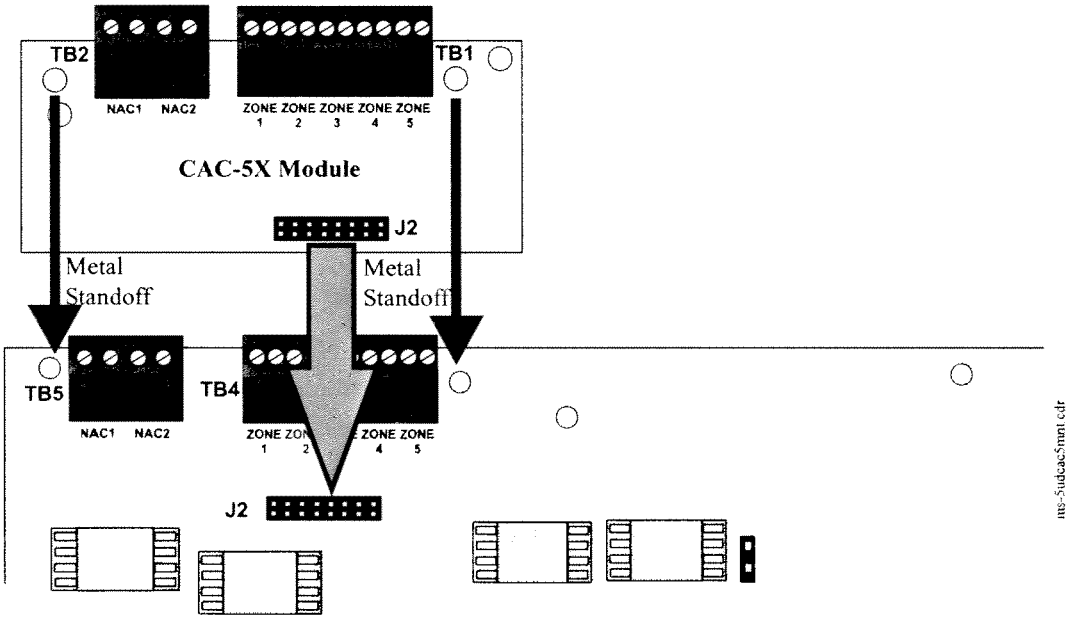
2.7.1 CAC-5X Class A Converter Module

2.7.1.1 Installation

The CAC-5X Module can be used to convert five Style B (Class B) Initiating Device Circuits to Style D (Class A) and the two Style Y (Class B) Notification Appliance Circuits to Style Z (Class A). The module plugs into connector J2 which is located at the top left of the GF505/ GF510 main circuit board and J7 which is located at the top center of the GF510. *Note that two CAC-5X modules are required to convert all NACs and IDCs on the* GF510 *to Class A circuits.*

To install the CAC-5X in the GF505/GF510, remove the two main circuit board mounting screws and replace with the two supplied male/female standoffs in the locations indicated in the following figure. Carefully align the connector on the CAC-5X with J2 on the FACP main circuit board and press the module securely into place. Make certain the pins are properly aligned to prevent bending or breaking of any connector pins. Secure the CAC-5X to the standoffs with the screws that were just removed.

To install the second CAC-5X on J7 of the GF510, remove the main circuit board mounting screw referenced in the following illustration and replace with the supplied male/female standoff. Insert the supplied plastic standoff in the location indicated in the following illustration. Carefully align the connector on the CAC-5X with J7 and press the module securely into place. Make certain the pins are properly aligned to prevent bending or breaking of any connector pins. Secure the CAC-5X to the metal standoff with the screw that was just removed.



GF510 Main Circuit Board

Figure 2.14 CAC-5X Module Installation

2.7.1.2 Wiring NACs and IDCs for Class A

Wire the Style Z (Class A) Notification Appliance Circuits using TB5 of the GF505/GF510 and TB2 of the CAC-5X module. Wire the Style D (Class A) Initiating Device Circuits using TB4 of the GF505/GF510 and TB1 of the CAC-5X. Note that the wiring will be identical when using TB7 NAC and TB6 IDC of the GF510. Make certain to observe polarity when connecting the devices to the circuits. The B+ and A+ terminals must comprise the feed and return for the positive side of a device and the B- and A- terminals must comprise the feed and return for the negative side of a device. To configure any of the zones for Class B when the CAC-5X is installed, simply wire to the B+ and B- input on the FACP terminal(s) and install the End-of-Line Resistor after the last device on the circuit. Do not wire to the corresponding A+ and A- terminals on the CAC-5X module.

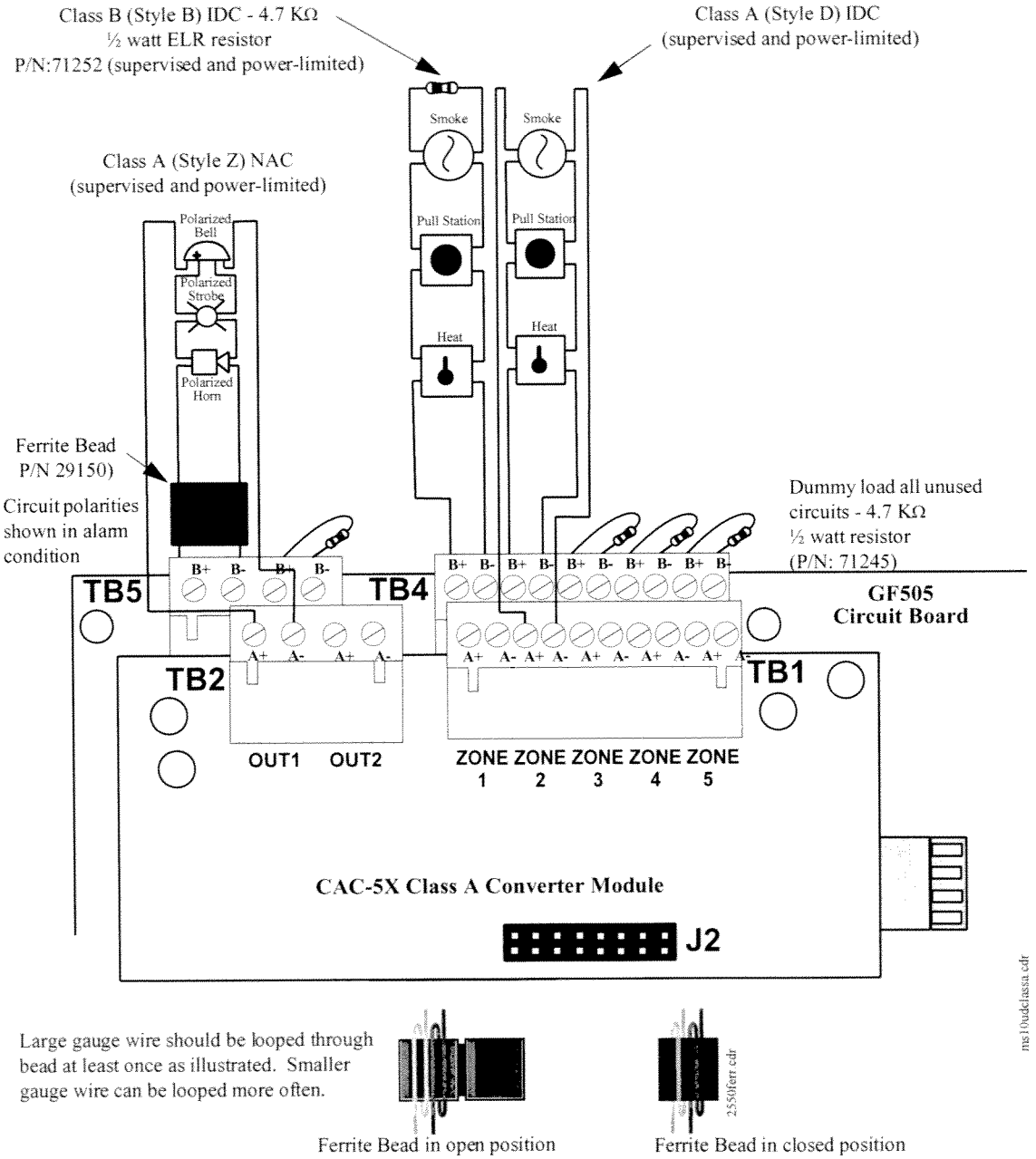


Figure 2.15 Wiring NACs and IDCs for Class A Operation

2.7.2 4XTMF Option Module

The 4XTMF module can be plugged into connectors J4 and J5 on the main circuit board.

The following steps must be followed when installing the 4XTMF module:

1. Remove all power (AC and DC) from the FACP before installing the modules
2. Cut jumper JP30 on the main circuit board to allow the control panel to supervise the placement of the 4XTMF option module
3. Install the two supplied metal standoffs in the locations indicated. These standoffs provide the required earth ground protection
4. Carefully plug the connectors on the option module into connectors J4 and J5 on the FACP main circuit board, being careful not to bend any pins
5. Secure the option module to the standoff on the main circuit board with the supplied screws
6. When the installation has been completed, connect the wiring to the modules as indicated in the following sections
7. Test system for proper operation

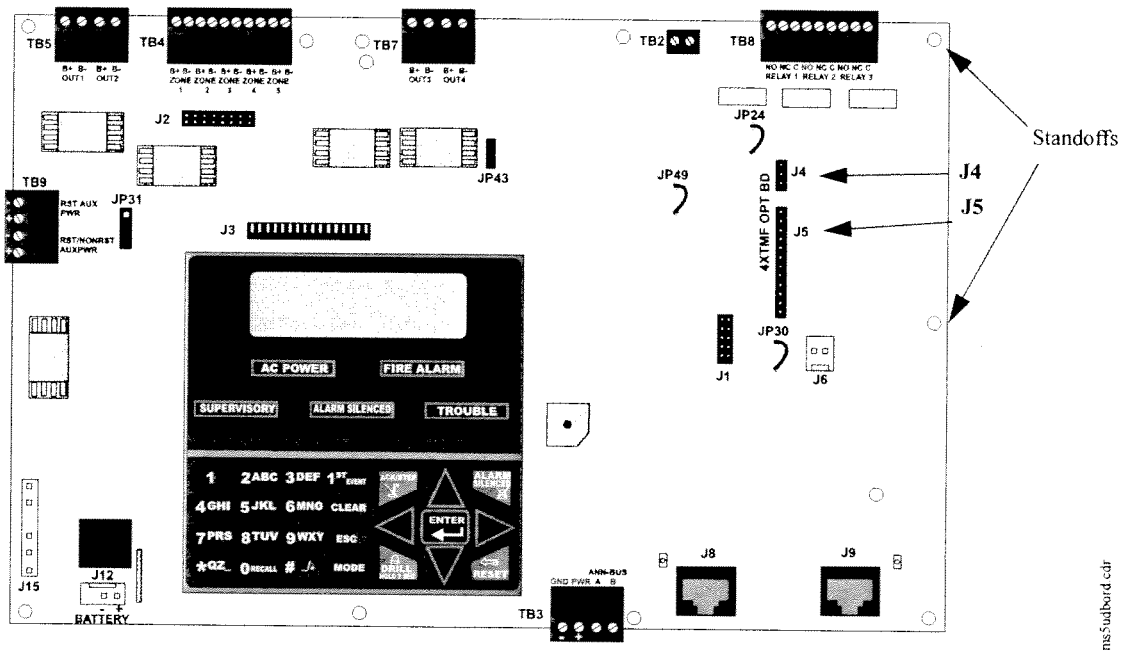


Figure 2.16 4XTMF Option Module Connection to GF505

2.7.2.1 4XTMF Transmitter Module Installation

The 4XTMF provides a supervised output for a local energy municipal box transmitter in addition to alarm and trouble reverse polarity. A jumper option allows the reverse polarity circuit to open with a system trouble condition if no alarm condition exists. A disable switch allows disabling of the transmitter output during testing to prevent accidental calling of the monitoring service.

Local Energy Municipal Box Service (NFPA 72 Auxiliary Fire Alarm Systems):
Supervisory Current: 5.0 mA
Trip Current: 350 mA (subtracted from notification appliance power)
Coil Voltage: 3.65 VDC
Maximum Coil Resistance: 14.6 ohms
Maximum allowable wire resistance between panel and trip coil: 3 ohms
Municipal Box wiring can leave the building

Remote Station Service (NFPA 72 Remote Station Fire Alarm Systems) - Intended for connection to a polarity reversal circuit or a Remote Station receiving unit having compatible ratings:
Maximum load for each circuit: 10 mA
Reverse polarity output voltage: 24 VDC
Remote Alarm and Remote Trouble wiring can leave the building

Before installing the module, place the disconnect switch to the down (disconnect) position to prevent accidental activation of the municipal box. Note that a Disconnect LED will illuminate after the module is installed in the FACP. In addition, the System Trouble LED will turn on to indicate the Disconnect condition.

Note: 4XTMF Module is not suitable for transmitting reverse polarity supervisory signal.

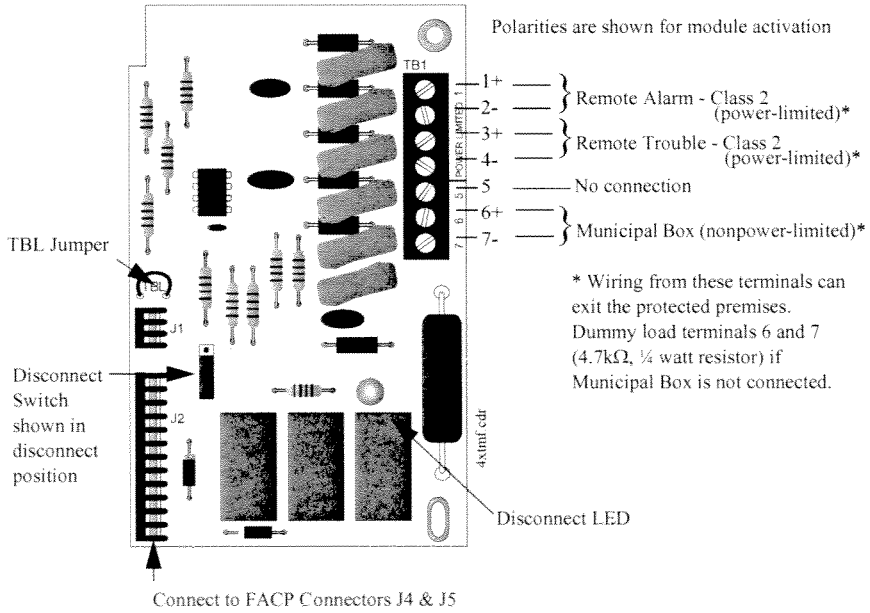


Figure 2.17 4XTMF Transmitter Module

2.8 ANN-BUS Devices

WARNING! *Disconnect all sources of power (AC and DC) before installing or removing any modules or wiring.*

A variety of optional devices can be connected to the FACP ANN-BUS communication circuit. Compatible devices include:

- GFANN-80 LCD Annunciator
- GFANN-S/PG Serial/Parallel Printer Interface Module
- GFANN-I/O LED Driver Module
- GFANN-LED Annunciator Module
- GFANN-RLY Relay Module

2.8.1 ANN-BUS Wiring

This section contains information on calculating ANN-BUS wire distances and the types of wiring configurations (Class B).

2.8.1.1 Calculating Wiring Distance for ANN-BUS Modules

The following instructions will guide the installer in determining the type of wire and the maximum wiring distance that can be used with FACP ANN-BUS accessory modules.

To calculate the wire gauge that must be used to connect ANN-BUS modules to the FACP, it is necessary to calculate the total worst case current draw for all modules on a single 4-conductor bus. The total worst case current draw is calculated by adding the individual worst case currents for each module. The individual worst case values are shown in the following table:

Model Number	Worst Case Current Draw
GFANN-80 LCD Annunciator	0.040 amps
GFANN-S/PG Serial/Parallel Printer Interface Module	0.040 amps
GFANN-I/O LED Driver Module	0.200 amps
GFANN-LED Annunciator Module	0.068 amps
GFANN-RLY Relay Module	0.075 amps

Note: Total worst case current draw on a single ANN-BUS cannot exceed 0.5 amp.

After calculating the total worst case current draw, Table 2.1 specifies the maximum distance the modules can be located from the FACP on a single wire run. The table ensures 6.0 volts of line drop maximum. In general, the wire length is limited by resistance, but for heavier wire gauges, capacitance is the limiting factor.

These cases are marked in the chart with an asterisk (*). Maximum length can never be more than 6,000 feet (1,800 m), regardless of gauge used. The formula used to generate this chart is shown in the note below.

Wiring Distance: ANN-BUS Modules to FACP				
Total Worst Case Current Draw (amps)	**22 Gauge**	**18 Gauge**	**16 Gauge**	**14 Gauge**
0.100	1,852 ft.	4,688 ft.	* 6,000 ft.	*6,000 ft.
0.200	926 ft.	2,344 ft.	3,731 ft.	5,906 ft.
0.300	617 ft.	1,563 ft.	2,488 ft.	3,937 ft.
0.400	463 ft.	1,172 ft.	1,866 ft.	2,953 ft.
0.500	370 ft.	938 ft.	1,493 ft.	2,362 ft.

Table 2.1 Wiring Distances

Note: The following formulas were used to generate the wire distance chart:

$$\text{Maximum Resistance (Ohms)} = \frac{6.0 \text{ Volts}}{\text{Total Worst Case Current Draw (amps)}}$$

$$\text{Maximum Wire Length (feet) (6,000 feet maximum)} = \frac{\text{Maximum Resistance (Ohms)}}{\text{Rpu}} * 500$$

where: Rpu = Ohms per 1,000 feet for various Wire Gauges (see table below)

Wire Gauge	Ohms per 1,000 feet (Rpu)
22	16.2
18	6.4
16	4.02
14	2.54

Wiring Distance Calculation Example:

Suppose a system is configured with the following ANN-BUS modules:

- 2 GFANN-80 Remote Fire Annunciators
- 1 GFANN-S/PG Serial/Parallel Printer Interface Module
- 1 GFANN-I/O LED Driver Module

The total worst case current is calculated as follows:

GFANN-80 Current Draw	= 2 X 0.040 amps	= 0.080 amps
GFANN-S/PG Current Draw	= 1 X.0.040 amps	= 0.040 amps
GFANN-I/O Current Draw	= 1 X.0.200 amps	= 0.200 amps
Total Worst Case Current Draw		= 0.320 amps

Using this value and referring to the Wiring Distance Table 2.1 on page 37, it can be found that the available options are:

- ✓ 463 feet maximum using 22 Gauge wire
- ✓ 1,172 feet maximum using 18 Gauge wire
- ✓ 1,866 feet maximum using 16 Gauge wire
- ✓ 2,953 feet maximum using 14 Gauge wire

2.8.1.2 Wiring Configuration

Figure 2.18 illustrates the wiring between the FACP and ANN-BUS devices.

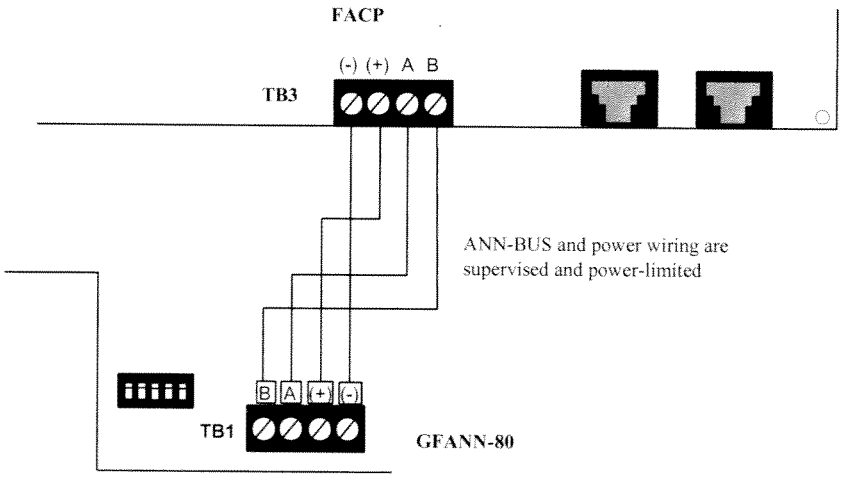


Figure 2.18 FACP wiring to ANN-BUS Device

2.8.1.3 Powering ANN-BUS Devices from Auxiliary Power Supply

Figure 2.19 illustrates the powering of ANN-BUS devices from an auxiliary power supply such as the HPF24S6/8, when the maximum number of ANN-BUS devices exceeds the ANN-BUS power requirements.

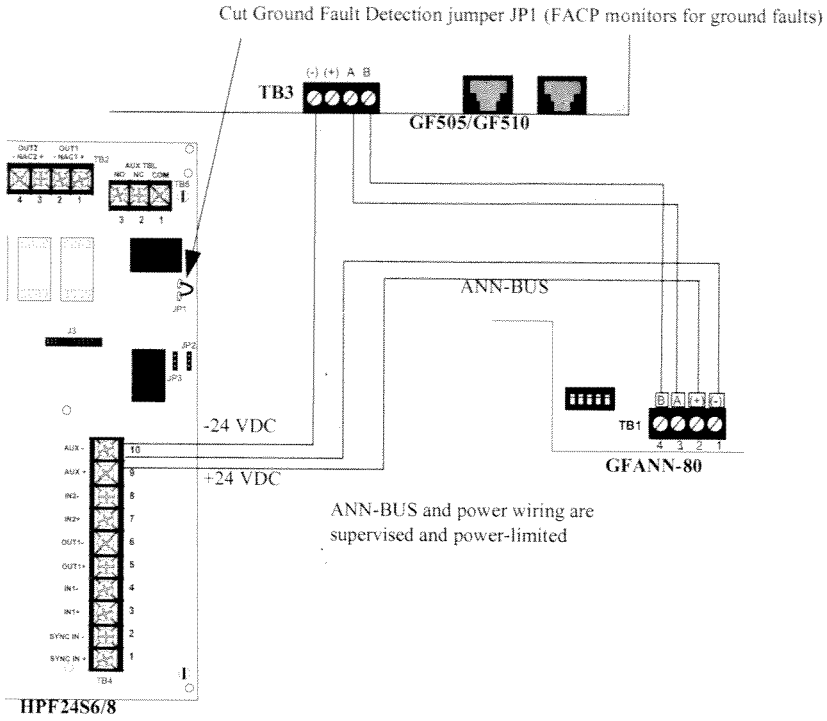


Figure 2.19 Powering ANN-BUS Devices from HPF24S6/8

2.8.2 ANN-BUS Device Addressing

Each ANN-BUS device requires a unique address (ID Number) in order to communicate with the FACP. A 5-position DIP switch on each device is used to set this address. The address set for these devices must also be programmed at the FACP for the specific device (refer to the programming section titled "ANN-BUS" on page 76).

A maximum of 8 devices can be connected to the FACP ANN-BUS communication circuit. Device addresses do not need to be sequential and can be set to any number between *01* and *08*. Note that *00* is not a valid address. The following table shows the DIP switch setting for each address.

Note: address (ID Number) DIP switches on some devices may have more than 5 switch positions. Unless otherwise specified in the documentation supplied with each device, switch positions 6 and above must be set to ***OFF****.*

Address	Switch 5	Switch 4	Switch 3	Switch 2	Switch 1
not valid	OFF	OFF	OFF	OFF	OFF
01	OFF	OFF	OFF	OFF	ON
02	OFF	OFF	OFF	ON	OFF
03	OFF	OFF	OFF	ON	ON
04	OFF	OFF	ON	OFF	OFF
05	OFF	OFF	ON	OFF	ON
06	OFF	OFF	ON	ON	OFF
07	OFF	OFF	ON	ON	ON
08	OFF	ON	OFF	OFF	OFF

2.8.3 GFANN-80 Remote Fire Annunciator

The GFANN-80 Annunciator is a compact, 80 character, backlit LCD remote fire annunciator which mimics the FACP display. It also provides system status indicators for AC Power, Alarm, Trouble, Supervisory and Alarm Silenced conditions. Communication between the GFANN-80 and FACP is accomplished over a two wire serial interface employing the ANN-BUS communication format. The devices are powered, via two additional wires, from either the host FACP or remote UL-listed, filtered, power supply.

2.8.4 Specifications

- Operating Voltage Range: 18 VDC to 28 VDC
- Current Consumption @ 24 VDC nominal (filtered and nonresettable):
  - ✓ Normal/Standby (no activity): 37.0 mA
  - ✓ Trouble: 39.0 mA
  - ✓ Alarm: 40.0 mA
  - ✓ AC Fail (not backlit): 15.0 mA
- For use indoors in a dry location

2.8.5 Installation

Ensure that all power (AC and DC) has been removed from the FACP before installing the annunciator.

2.8.5.1 Mounting

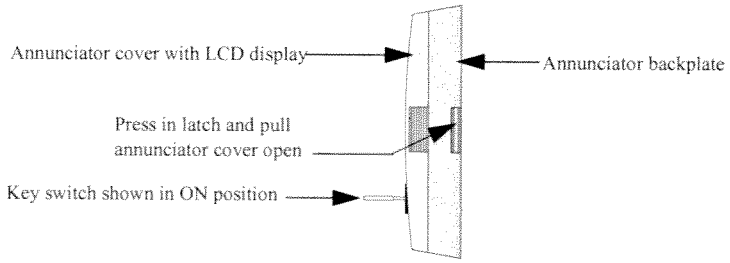
The GFANN-80 can be surface or semi-flush mounted to a single, double or 4" square electrical box. Select and remove the appropriate knockout(s), pull the necessary wires through the knockouts and mount the annunciator in or on the wall depending on the type of installation desired.

The GFANN-80 cover must be attached to the annunciator backplate before mounting the annunciator to the electrical box/wall. The cover cannot be reattached or removed after the annunciator has been mounted.

2.8.5.2 Opening/Closing Annunciator

The following procedure details the steps used to open the annunciator in order to access the terminal block and DIP switches (refer to figure below):

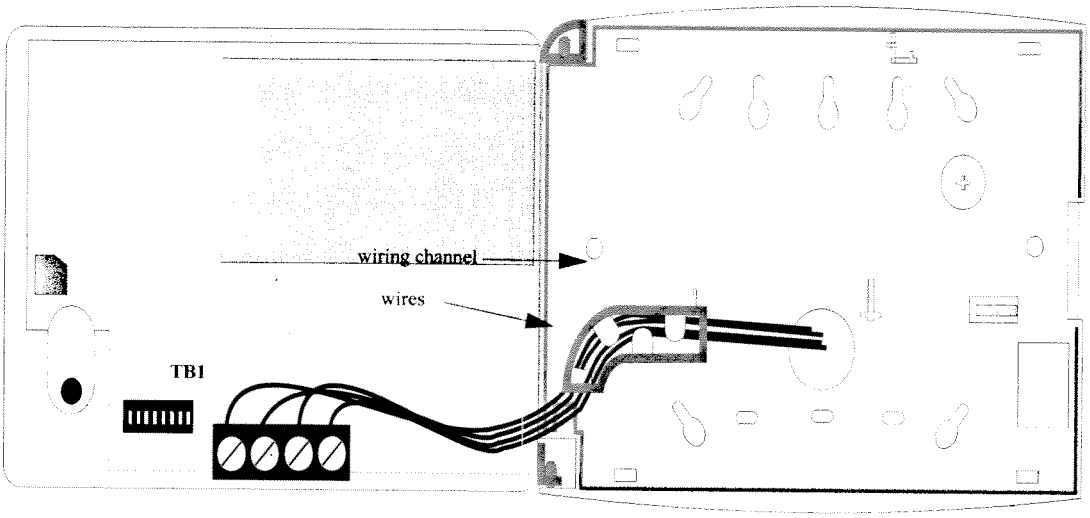
1. Turn the key switch to the ON (Unlocked) position by turning the key counter-clockwise
2. Push in the snap latch located on the right side of the unit while pulling the cover open
3. To close the cover, make certain the key switch is in the ON (Unlocked) position. Swing the cover closed, snapping it shut
4. Turn the key switch to the OFF (Locked) position by turning clockwise and remove the key



2.8.5.3 Wiring GFANN-80 to FACP

The following steps can be used as a guide to wire the annunciator. Make certain all power has been removed from the FACP prior to annunciator installation.

1. Route wires from hole in backplate, through wiring channel and then to GFANN-80 terminal block TB1



2. Remove appropriate amount of wire insulation
3. Connect the wiring from the FACP ANN-BUS to annunciator TB1 terminals 3 (A) & 4 (B). Make certain to connect A to A and B to B
4. If appropriate, connect the wiring going to the next device on the ANN-BUS to TB1 terminals 3 & 4. Make certain to connect A to A and B to B
5. Connect the wiring from the 24 VDC power source to annunciator TB1 terminals 1 (-) & 2 (+). Make certain to observe proper polarity
6. If appropriate, connect the power wiring going to the next device to terminals 1 (-) & 2 (+). Make certain to observe proper polarity
7. After all connections are made, remove extra wire from inside of annunciator by dressing it neatly through wire channel, with any excess wire pushed back through hole into electrical box

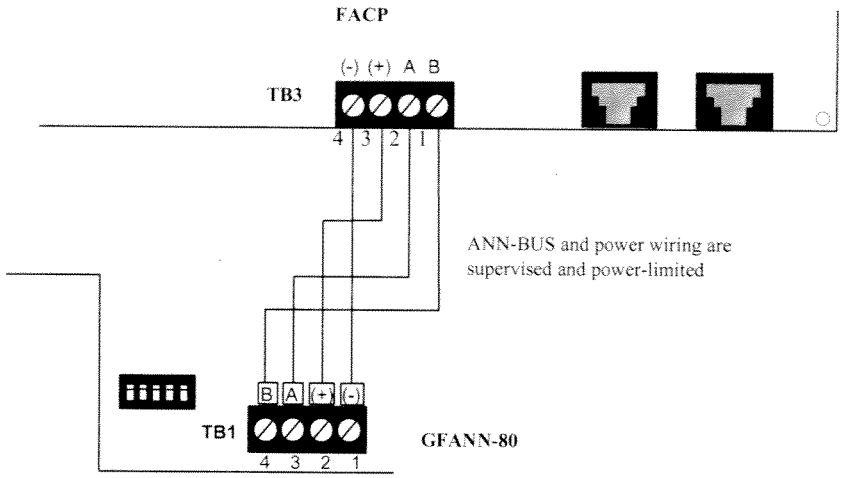


Figure 2.20 GFANN-80 Wiring to FACP

The following table shows the GFANN-80 connections to the GF505/GF510.

GF505/GF510 (TB3)	GFANN-80 (TB1)
Terminal 3 GND (-)	Terminal 1 (-)
Terminal 4 PWR (+)	Terminal 2 (+)
Terminal 2 A (ANN-BUS)	Terminal 3 (A)
Terminal 1 B (ANN-BUS)	Terminal 4 (B)

Programming

Following installation and wiring of the GFANN-80 LCD annunciator to the FACP, the annunciator must be added to the system via FACP programming. Refer to the programming section titled "ANN-BUS" on page 76 in this manual for detailed programming information. Select the LCD option for programming.

2.8.6 GFANN-S/PG Serial/Parallel Printer Interface Installation

The GFANN-S/PG Serial/Parallel Printer Interface module allows the ancillary connection of a serial and/or parallel printer to the FACP for a real-time log of system events, detector status reports and event history. Proceed with the installation as described in the following:

1. Ensure that all power (AC and DC) has been removed from the FACP.
2. Connect the GFANN-S/PG to the FACP as illustrated in Figure 2.21

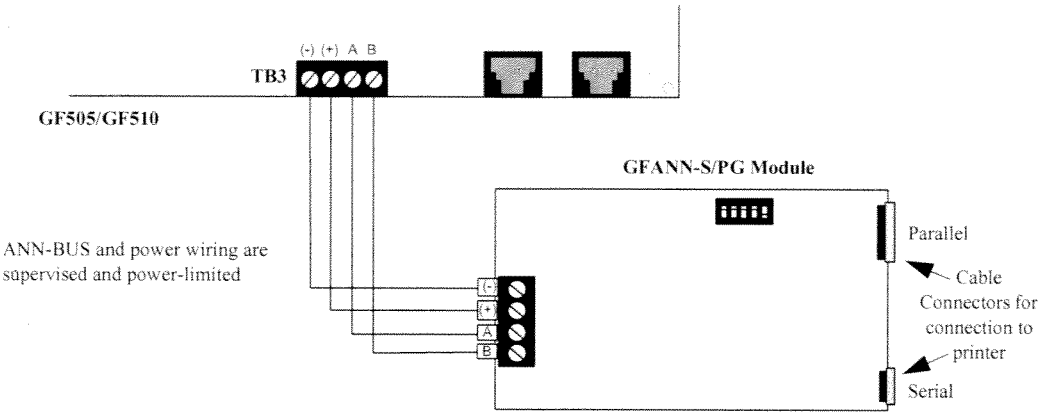


Figure 2.21 GFANN-S/PG Connection to FACP

3. Using the DIP switches on the back of the GFANN-S/PG module, assign an ID number (address) to the module
4. Select the address and configuration options for the GFANN-S/PG module as described in the Programming section of this manual (refer to "ANN-BUS" on page 76)
   Note that the Auto-configure feature allows the programmer to quickly bring all installed ANN-BUS modules online (refer to "Auto-Configure" on page 77)
5. Connect a printer to the GFANN-S/PG Parallel and/or Serial connectors (refer to Figure 2.21 on page 43)

2.8.6.1 Specifications

- Operating Voltage: 24 VDC
- Current (Alarm and Standby): 45 mA
- Ambient Temperature: 32°F to 120°F (0°C to 49°C)
- Max. Wiring Distance from FACP: 6,000 ft. (1,800 m)
- Mounting: Surface
- Dimensions: 6"W x 7-3/4"H x 1-7/16"D (15.2 cm W x 19.7 cm H x 3.7 cm D)
- For indoor use in a dry location only

2.8.6.2 PRN Printer Installation

When connected to the FACP via the GFANN-S/PG module, the PRN prints the status changes within the control panel and time-stamps the printout with the time of day and date that the event occurred. It provides 80 columns of data on standard 9" x 11" tractor-feed paper. This section contains information on connecting a printer to the control panel and setting the printer options.

2.8.6.2.1 Connecting PRN Printer

Remote printers require a primary AC power source. If required for the fire alarm system configuration (for example, a Proprietary Fire Alarm System), a remote printer requires a secondary power source (battery backup). Since a secondary power source is not provided as a standard feature, a separate UL-listed Uninterruptible Power Supply (UPS) should be used. The building emergency power supply may be used, as long as it meets the power continuity requirements of NFPA 72. Refer to NFPA 72 for further details.

Connect the remote printer to the FACP via the GFANN-S/PG module using a standard DB-25 cable. One end of the cable will plug into the DB-25 connector on the PRN printer and the other end plugs into the parallel connector on the GFANN-S/PG module. Note that the 9-pin DB-9 port on the GFANN-S/PG is used to connect a serial printer. The 25-pin port is used for a Centronics parallel printer cable. Connect either a serial or parallel printer, but not both at the same time.

2.8.6.2.2 Setting Printer Options

Refer to the documentation supplied with the PRN printer for instructions on using the printer menu controls. Set the printer options (under the menu area) as shown in the following table:

Table 2.2 PRN Setup Options

Option	Setting	Option	Setting
Font	HS Draft	CPI	10CPI
LPI	6 LPI	Skip	0.5
ESC Character	ESC	Emulate	Epson FX-850
Bidirectional Copy	ON	I/O	
CG-TAB	Graphic	Buffer	40K
Country	E-US ASCII	Serial	
Auto CR	OFF	Baud	9600 or 2400
Color Option	Not Installed	Format	7 Bit, Even, 1 Stop
Formien		Protocol	XON/XOFF
Lines	6LPI=60	Character Set	Standard
Standard	Exec 10.5	SI.Zero	On
		Auto LF	On
		PAPER	
		BIN 1	12/72"
		BIN 2	12/72"
		SINGLE	12/72"
		PUSH TRA	12/72"
		PULL TRA	12/72"
		PAP ROLL	12/72"

2.8.7 GFANN-I/O LED Driver Module

The GFANN-I/O is an LED driver module that can be used in a wide variety of applications, including as an interface with most customized graphic annunciators. The GFANN-I/O can drive up to 40 LEDs. The following sections describe hardware installation. Refer to the section titled "ANN-BUS" on page 76 for programming information.

2.8.7.1 GFANN-I/O Board Layout

Figure 2.22 illustrates the GFANN-I/O board showing locations of screw terminals for connection to the FACP, pin connectors for connecting LEDs and the DIP switch for selecting the ANN-BUS ID number.

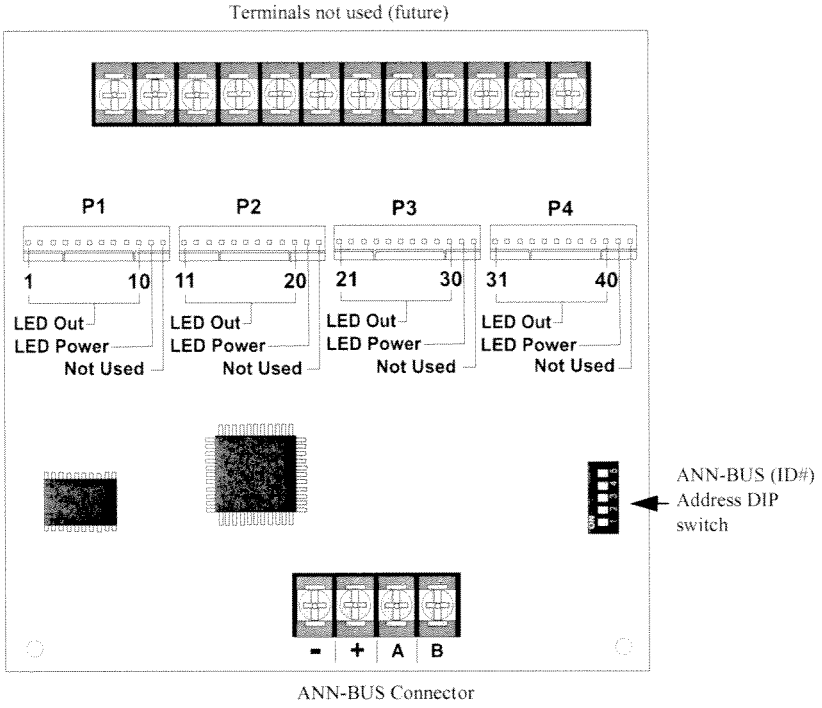


Figure 2.22 GFANN-I/O Board Layout

2.8.7.2 Specifications

- Max. ANN-BUS Voltage: 28 VDC
- Max. Current:
  - ✓ Alarm: 200 mA
  - ✓ Standby: 35 mA
  - ✓ Each LED: 10 mA
- Operating Temperature: 32°F to 120°F (0°C to 49°C)
- For indoor use in a dry location only

2.8.7.3 GFANN-I/O Connection to FACP

The GFANN-I/O connects to the FACP via the ANN-BUS as illustrated in Figure 2.23. After the GFANN-I/O is connected to the panel, it must be added to the system via FACP programming.

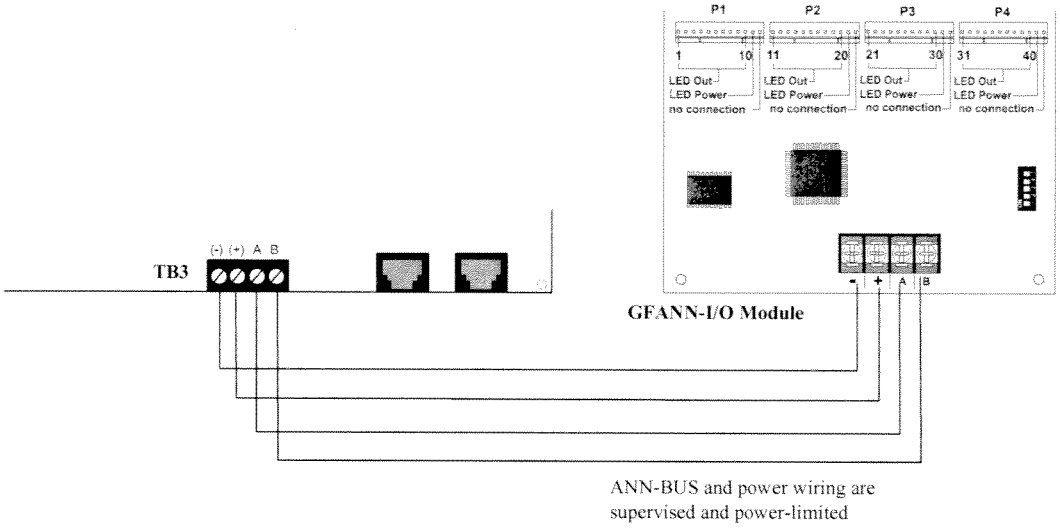


Figure 2.23 GFANN-I/O Connection to FACP

2.8.7.4 GFANN-I/O Module LED Wiring

There are four 12-pin connectors on the GFANN-I/O module for connecting LEDs. Each set of 10 LEDs get their power from Pin 11 of the corresponding connector. Internal resistors are sized so that there is approximately 10 mA of current for each LED. No series resistors are required. LED outputs are mapped to output circuits. Refer to the section titled "GFANN-I/O LED Zone Assignments" on page 79 of this manual.

The LEDs are wired as illustrated in Figure 2.24. Note that the illustration depicts only connectors P1 and P2. Wiring is identical for P3 (LEDs 21-30) and P4 (LEDs 31-40).

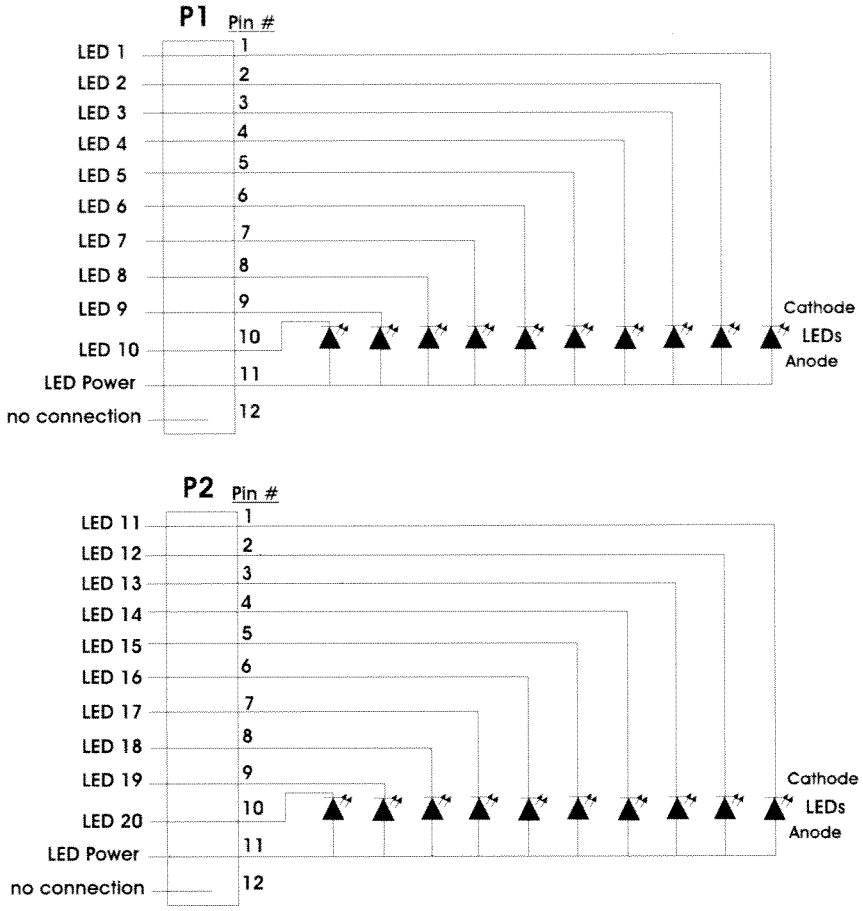


Figure 2.24 GFANN-I/O Board Layout

2.8.8 GFANN-LED Annunciator Module

The GFANN-LED annunciator module provides LED annunciation of general system faults and input zones/points when used with a compatible FACP. The GFANN-LED module provides alarm (red), trouble (yellow) and supervisory (yellow) indication for up to ten input zones or addressable points.

2.8.8.1 GFANN-LED Board Layout

Figure 2.25 illustrates the GFANN-LED board showing locations of screw terminals for connection to the FACP and the DIP switches for selecting the ANN-BUS ID number.

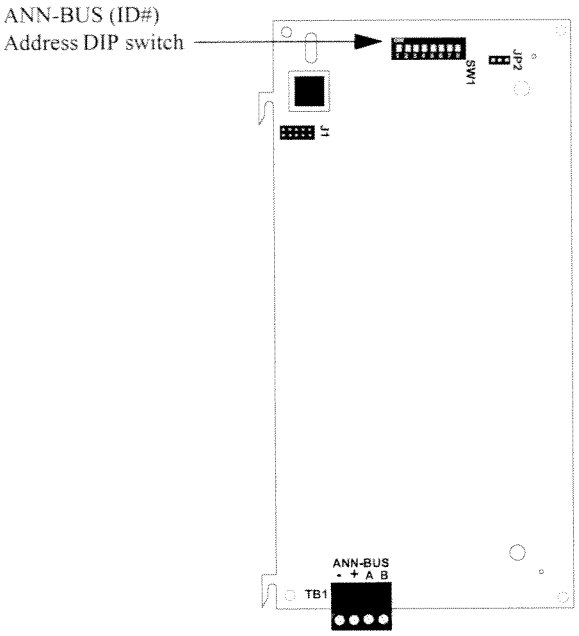


Figure 2.25 GFANN-LED Board Layout

2.8.8.2 Specifications

- Max. ANN-BUS Voltage: 24 VDC
- Max. Current:
  - ✓ Alarm: 68 mA
  - ✓ Standby: 28 mA
- Operating Temperature: 32° F to 120° F (0° C to 49° C)
- For indoor use in a dry location only

2.8.8.3 Mounting/Installation

The GFANN-LED Module is supplied mounted to the DP-51050LED/W Dress Panel. Install the dress panel as described in the documentation supplied with the DP-51050LED.

2.8.8.4 GFANN-LED Connection to FACP

Figure 2.26 illustrates the GFANN-LED board wiring connections to the FACP.

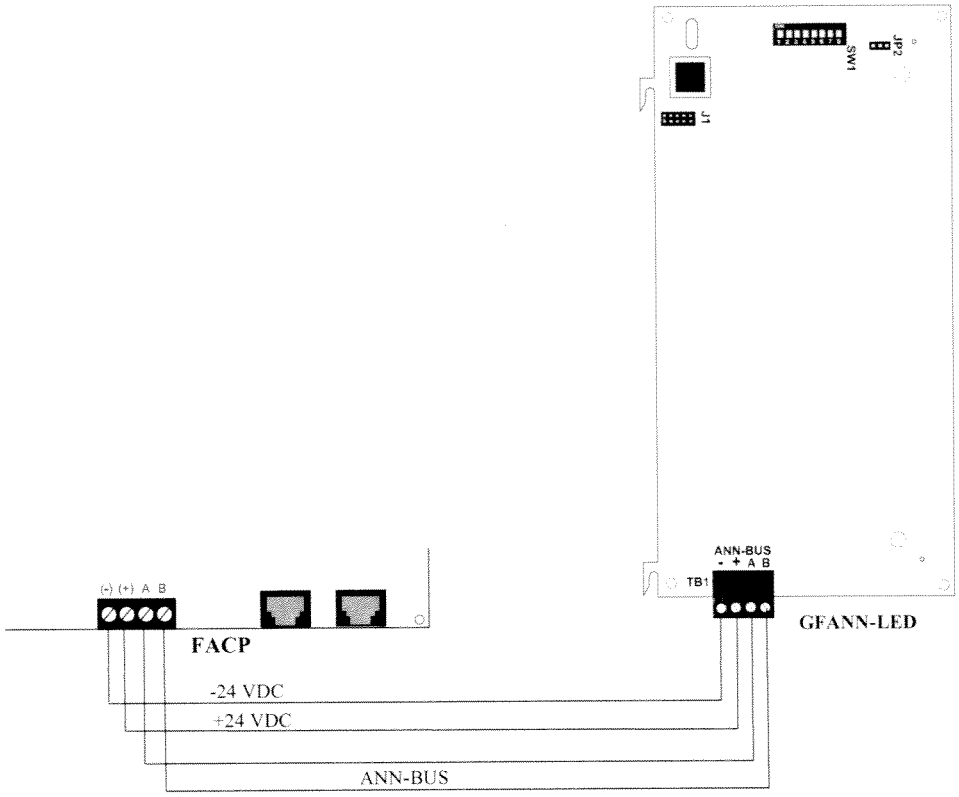


Figure 2.26 GFANN-LED Connection to FACP

2.8.9 GFANN-RLY Relay Module

The GFANN-RLY relay module provides 10 programmable Form-C relays when used with a compatible FACP.

2.8.9.1 GFANN-RLY Board Layout

Figure 2.27 illustrates the GFANN-RLY board showing locations of screw terminals for connection to the FACP and the DIP switches for selecting the ANN-BUS ID number.

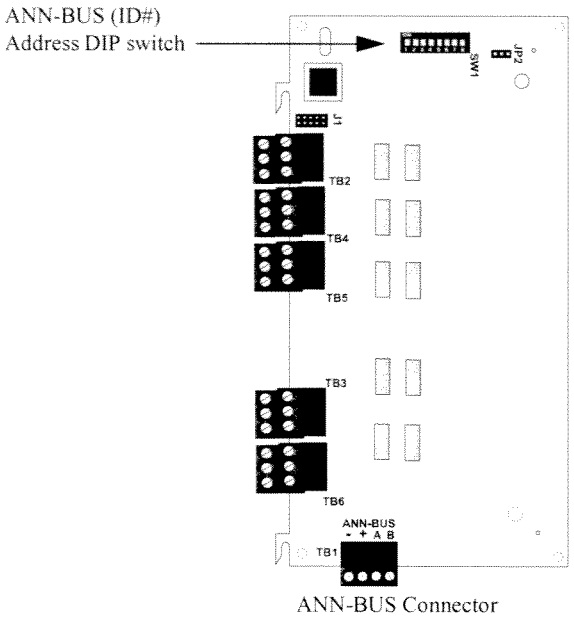


Figure 2.27 GFANN-RLY Board Layout

2.8.9.2 Specifications

- Operating Voltage: 24 VDC
- Max. Current:
  - ✓ Alarm: 75 mA
  - ✓ Standby: 15 mA
- Relay Contact Ratings:
  - ✓ 2 amps @ 30 VDC (resistive)
  - ✓ 0.5 amps @ 30 VAC (resistive)
- Operating Temperature: 32° F to 120° F (0° C to 49° C)
- For indoor use in a dry location only

2.8.9.3 Mounting/Installation

The GFANN-RLY relay module can be mounted inside the FACP main circuit board chassis.

2.8.9.4 GFANN-RLY Connection to FACP

Figure 2.28 illustrates the GFANN-RLY board wiring connections to the FACP.

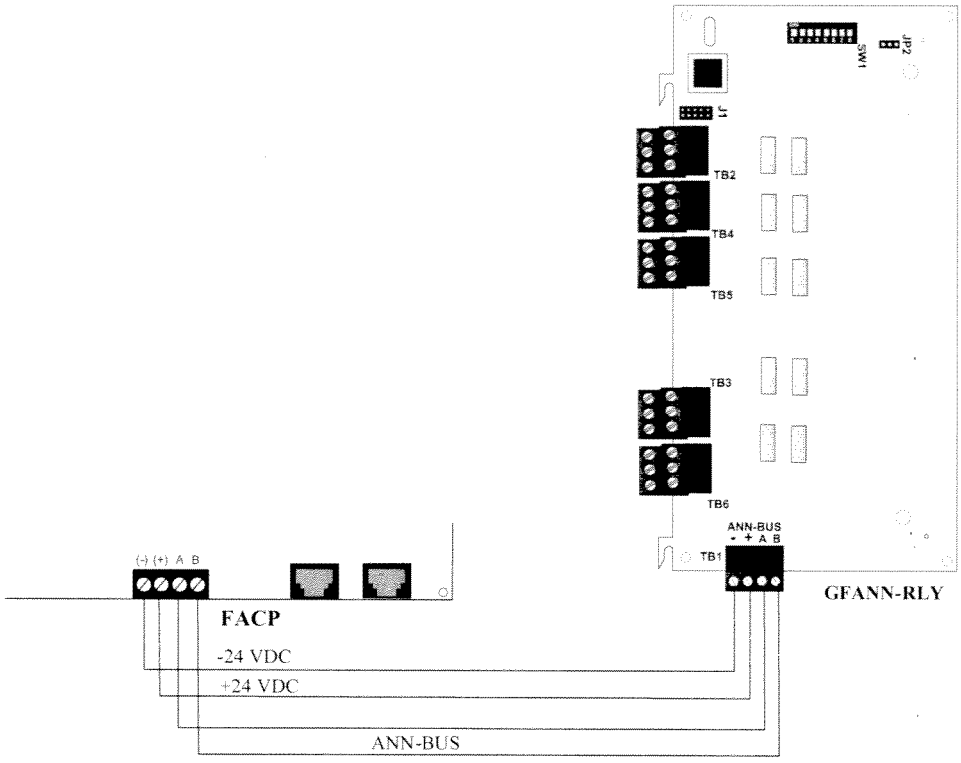


Figure 2.28 GFANN-RLY Connection to FACP

SECTION 3 Programming

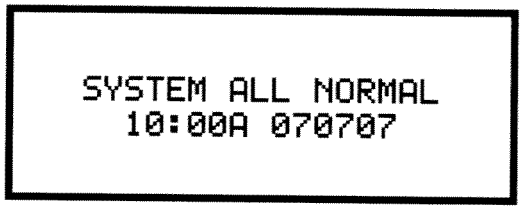
3.1 User Programming

The GF505/GF510 FACP is completely field programmable using the panel keypad and requires no special software skills. *While programming the FACP, the fire protection capabilities of the control panel are enabled.*

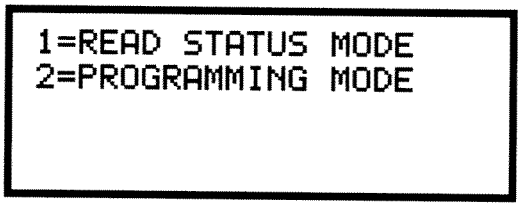
Site-specific programming may be accomplished:

- Manual programming or editing, using the FACP keypad

The *System All Normal* screen will be displayed in a programmed system with no active alarms, troubles or supervisories, as illustrated below:



Read Status mode can be entered while the panel is in any mode of operation. If an alarm or supervisory event exists at the panel, the event must be cleared before entering Programming mode. To access any of the programming or read status features, the *Enter* or *Mode* key must be pressed, which will cause the LCD to display the following:



Pressing *1*, while this screen is being displayed, will cause the control panel to enter the Read Status Mode which allows the user to view the programmed features and status of the control panel The Read Status feature is not password protected. Refer to "Read Status" on page 112 for a detailed description of this feature.

See Page

Pressing *2* will select user Programming Mode which may only be accomplished by an authorized person. After pressing *2*, a screen will prompt for a password. After entering the correct password, the user may select from a list of programming options.

Exit Programming and Read Status Mode

The programmer can exit any mode by repeatedly pressing the keypad *ESC* (Escape) key until the display reads System All Normal. *Note that the data which is entered during Programming mode is not saved until the programmer exits this mode by repeatedly pressing the 'ESC' key. If the Reset key is pressed or power is lost before exiting Programming mode, all data just entered will be lost.*

User Programming Levels

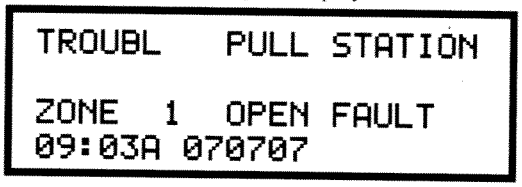
There are two user programming levels:

- User Master Program Level 1 is used for programming panel specific data relating to device types, zoning, messages, control panel functions, etc.
- User Maintenance Program Level 2 is used by a qualified operator to access features such as Disable/Enable, View and Clear History, Walktest and System Time Change.

3.2 Initial Power-up

The following sections describe the initial programming procedures for a new system. The same procedures are used to modify programming in an existing system.

After completing the wiring of devices to the FACP, apply power to the control panel. If wiring has not been completed and/or End-of-Line resistors are not installed at the panel. a trouble condition will be indicated at the panel a trouble message will be displayed on the LCD. Following is an example of a possible trouble message that may be displayed.



3.3 Programming Screens Description

Two options are available when the *Enter* key is pressed: Read Status and Programming Mode. The Read Status and Programming options have multiple functions or features which may be chosen. To view all of the choices, it is necessary that the programmer scroll through a number of additional *subscreens*. These selections are displayed on multiple screens to make them more readable for the programmer. Refer to "Master Programming Level" on page 55, for additional information on the various screens.

See Page

The title of the main option screen will always be displayed at the top of the subscreens for the programmer's convenience. If additional subscreens exist, an Up or Down arrow will be displayed in the upper right corner of the screen being viewed. The programmer can then press the keypad Up or Down arrow key to view the new subscreen. To select one of the choices in a screen, the programmer presses the keypad numerical key corresponding to the desired choice.

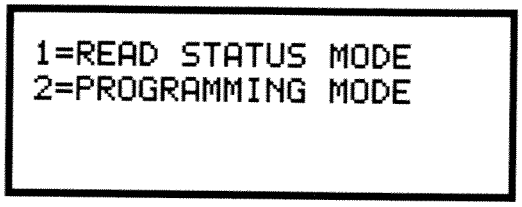
Note that subscreens may also have multiple options which require viewing more than one screen. The same process, as detailed in the previous paragraphs, is followed to view all option choices.

3.4 Programming and Passwords

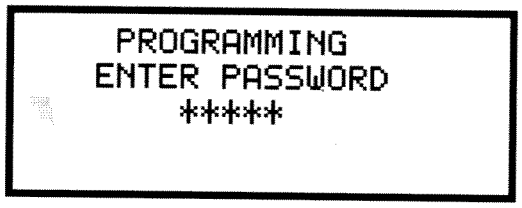
There are two factory set programming passwords which will access the Programming screens as indicated in the following examples. From either of the screens, access to specific system and device features or programming may be obtained. All user programming entries are stored in nonvolatile memory. The factory set passwords can be changed by the user as described in "Password Change" on page 97. If an invalid password is entered, the blinking cursor will return to the first password character position. To exit Programming or Read Status mode at any time, press the *ESC* (Escape) key repeatedly. Note that Programming mode must be exited using the *ESC* key in order to store the program data entered during this mode. If the *Reset* key is pressed or power is lost before exiting Programming mode, the data just entered will not be saved.

See Page

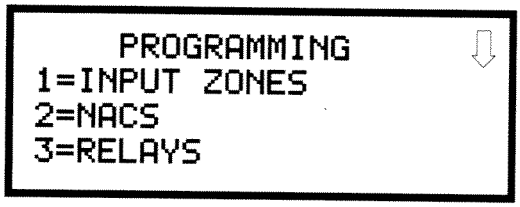
To access user Programming mode, press the *Enter* or *Mode* key. The LCD will display the following:



To enter the user Programming mode, press *2*. The display will read as follows:



Entering the ***Master*** level password (default *00000*) will cause the following screen to appear:

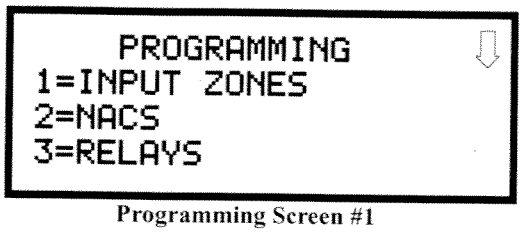


If the ***Maintenance*** level password (default *11111*) is entered, the following screen will appear:

Note that in the two preceding screens, an arrow appears to inform the programmer that additional options can be viewed by pressing the keypad *down* arrow key.

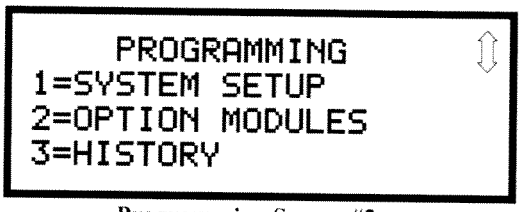
3.5 Master Programming Level

When the Master Program Level password is entered, the control panel will enter user Programming mode. In this mode, the piezo sounder remains off, the trouble relay is activated and the system Trouble LED flashes until Programming mode is exited. The following display will appear:

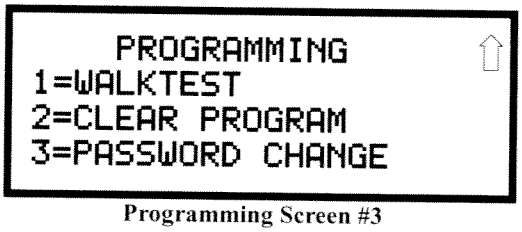


Programming Screen #1

The down arrow which appears in the display indicates that additional programming choices can be viewed by pressing the down arrow key on the keypad. If a down and up arrow appear in the display, pressing the 'down' arrow key will display the subsequent Programming Screens as illustrated below while pressing the 'up' arrow key will display the previous screen.



Programming Screen #2



Programming Screen #3

3.5.1 Input Zones

The Input Zones option allows the user to initially program or change the programming for the five input zones (circuits) on the GF505 or the ten input zones (circuits) on the GF510. Pressing *1*, while viewing Programming Screen #1, will select the Input Zones option and display a screen similar to the following:

```
PROGRAMMING
1=INPUT ZONES
2=NACS
3=RELAYS
```

Programming Screen #1

```
     INPUT ZONES
1=ZONE 1
2=ZONE 2
3=ZONE 3
```

Input Zone Screen #1

Pressing the down arrow key will display additional screens for Input Zones 4 through 5 in the GF505 or Input Zones 4 through 10 in the GF510. To program a specific zone, press the number key corresponding to the desired zone while viewing one of the Input Zone screens. To program Input Zone 1, press the *1* key while viewing Input Zone Screen #1. The following screens will be displayed:

```
Normal  PULL STATION

ZONE 1
 PRESS ⇩ TO EDIT
```

Edit Input Zone Screen #1

To change the programming for the displayed zone, press the keyboard 'down' arrow key to view the Edit Zone screens.

The following examples show the editing of Input Zone 1:

```
    INPUT ZONE 1
1=ENABLED          YES
2=TYPE  PULL STATION
3=VERIFICATION     NO
```

Edit Input Zone Screen #2

```
    INPUT ZONE 1
1=PAS/PRE-SIGNAL DLY
          NO DELAY
```

Edit Input Zone Screen #3

```
    INPUT ZONE 1
1=NOUN/ADJECTIVE
2=DESCRIPTION
**********************
```

Edit Input Zone Screen #4

Enable/Disable Zone

To Enable or Disable the zone, press the *1* key while viewing the Edit Input Zone Screen #2. Each press of the key will toggle the screen between *Enabled Yes* and *Enabled No*. If *Enabled No* is selected, the zone will be disabled by the control panel, preventing the circuit from reporting alarms and troubles to the panel. The control panel LCD will display the zone which has been disabled and FACP will turn on the Trouble LED.

```
   INPUT ZONE
1=ENABLED
2=TYPE
3=VERIFICATION
```

Edit Input Zone Screen #2

Type

To select the type of zone being programmed, press the *2* key while viewing the Edit Input Zone Screen #2. This will cause the control panel to display the following Zone Type Screen:

```
   ZONE TYPE                ⇩
1=PULL STATION
2=WATERFLOW
3=WATERFLOW NS
```

Zone Type Screen #1

Pressing the down arrow key will display additional zone types as indicated in the following table.

Zone Type	Action When Activated
Pull-Station	Fire Alarm
Waterflow	Fire Alarm Delayed (uses waterflow delay)
Waterflow Nonsilenceable	Fire Alarm (uses waterflow delay)
Combo	Fire/Supervisory (uses waterflow delay)
Combo AutoResettable Supervisory	Fire/Supervisory AR, nonlatching (uses waterflow delay)
2-Wire Detector	Fire Alarm
Normally Open Contact	Fire Alarm
Fire	Fire Alarm
Tamper	Supervisory
Supervisory	Supervisory, latching
Supervisory AutoResettable	Supervisory, nonlatching
Medic-Alert	Supervisory, latching
Hazard-Alert	Supervisory, latching
Tornado-Alert	Supervisory, latching
Proc-Mon	Piezo
Procmon-AR	Piezo, nonlatching
AC-Loss-Mon	Trouble
Ack-Switch	Acts like panel Acknowledge Key
Sil-Switch	Acts like panel Alarm Silence Key
Drill-Switch	Acts like panel Drill Key
Reset-Switch	Acts like panel Reset Key
PAS-Bypass	Positive Alarm Sequence Disable
Drill-Switch AutoResettable	Acts like panel Drill Key, nonlatching

```
   INPUT ZONE
1=ENABLED
2=TYPE
3=VERIFICATION
```

Edit Input Zone Screen #2

While viewing any Zone Type screen, select the type of zone being programmed by pressing the corresponding keyboard number key. The display will return to Edit Input Zone Screen #2 and indicate the selection next to the Type option.

Verification

Alarm verification is used to confirm that a smoke detector activation is a true alarm condition and not a false alarm. This feature is selected by pressing *3* while viewing the Edit Zone Screen #2 so that the display reads *Verification On*. Each time the *3* key is pressed, the display will toggle between *Verification On* and *Verification Off*. For a detailed description, refer to "Alarm Verification (None or One Minute)" on page 111.

See Page

Note that verification can only be enabled for a zone that is programmed as a smoke detector type. Zones programmed for any other type will not allow the Verification feature to be enabled. *Do <u>not</u> use the verification feature if a mix of smoke detectors and normally open contact devices are connected to the same zone.*

PAS/Pre-Signal Delay

Pressing 1 while viewing Edit Input Zone Screen #3 will display the following screen:

```
 PAS/PRE-SIG DELAY  ⇩
1=NO DELAY
2=PRE-SIGNAL DELAY
3=PAS DELAY
```

PAS/Pre-Signal Delay Screen

```
 INPUT ZONE #
1=PAS/PRE-SIGNAL DLY
       NO DELAY
```

Edit Input Zone Screen #3

Pre-signal

The Pre-signal option programs the zone to delay panel activation for a preprogrammed time delay of up to three minutes while allowing for visual verification by a person. Note that the alarm relay and communicator will respond to the initial alarm immediately. To enable the Pre-signal feature, press *2* while viewing PAS/Pre-Signal Screen. Refer to "Presignal" on page 109.

See Page

PAS

The PAS (Positive Alarm Sequence) option will program the zone to delay panel activation (including alarm relay and communicator) for a period of 15 seconds plus a programmable time of up to 3 minutes. To enable the PAS feature, press *3* while viewing the PAS/Pre-Signal Screen. This option is available only for circuits programmed as smoke detector circuits. Refer to "Positive Alarm Sequence" on page 109.

See Page

Noun/Adjective

The Noun/Adjective selection allows the programmer to enter specific descriptors about the detector currently being programmed. Pressing *1* while viewing Edit Input Zone Screen #4 will cause the following screen to be displayed:

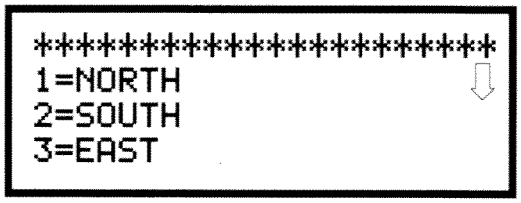
```
1=STANDARD ADJECTIVE
2=STANDARD NOUN
3=FUTURE USE
4=FUTURE USE
```

Noun/Adjective Screen

```
  INPUT ZONE #
1=NOUN/ADJECTIVE
2=DESCRIPTION
****************
```

Edit Input Zone Screen #4

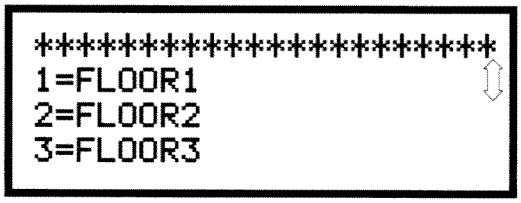
Pressing *1* while viewing the Noun/Adjective Screen will cause the following screen(s) to be displayed. Note that the keyboard *down* arrow key must be pressed to see all the Adjective screens. Press the number corresponding to the adjective that is to be used as a descriptor for the location of the detector currently being programmed. When an adjective has been selected, it will appear at the top of the display as indicated by the asterisks.



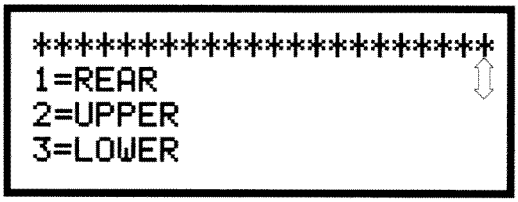
Adjective Screen #1

Adjective Screen #5

Adjective Screen #2



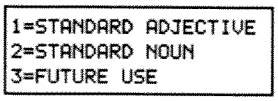
Adjective Screen #6



Adjective Screen #3

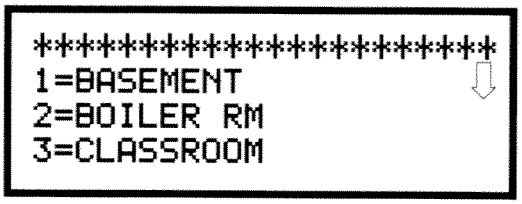
Adjective Screen #7

Adjective Screen #4

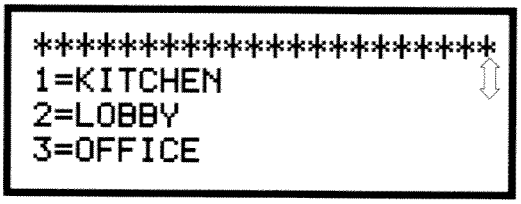


Noun/Adjective Screen

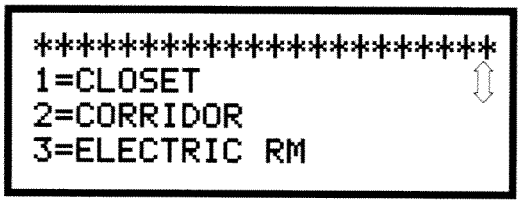
Pressing *2* while viewing the Noun/Adjective Screen will cause the following screen(s) to be displayed. Note that the keyboard *down* arrow key must be pressed to see all the Noun screens. Press the number corresponding to the noun that is to be used as a descriptor for the location of the detector currently being programmed. When a noun has been selected, it will appear at the top of the display as indicated by the asterisks.



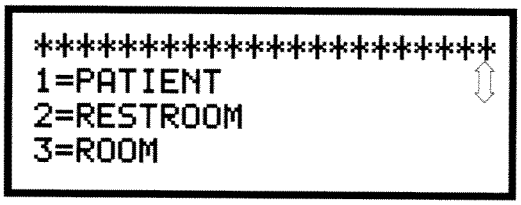
Noun Screen #1



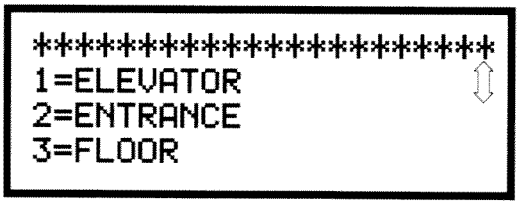
Noun Screen #5



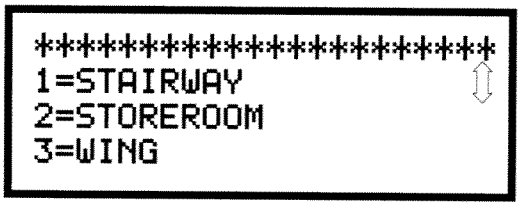
Noun Screen #2



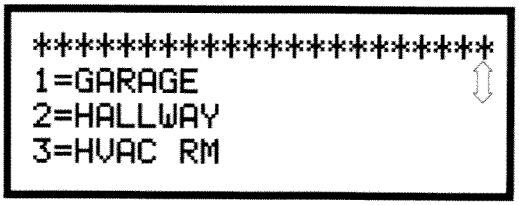
Noun Screen #6



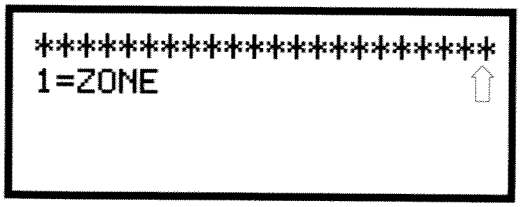
Noun Screen #3



Noun Screen #7



Noun Screen #4



Noun Screen #8

Description

The Description selection allows the programmer to enter additional information about the detector currently being programmed. This information will be displayed as part of the device label on the display. Pressing *2* while viewing Edit Input Zone Screen #4 will cause the following screen to be displayed:

```
INPUT ZONE #
1=NOUN/ADJECTIVE
2=DESCRIPTION
```

Edit Input Zone Screen #4

```
ZONE # DESCRIPTION

PRESS ENTER IF DONE
**********
```

Adjective/Noun Screen

A flashing cursor will appear at the first asterisk to the left. The programmer can enter additional descriptive information about the device being programmed. This information will appear on the display along with the standard device label information.

A maximum of 20 characters (including spaces) can be entered. To enter alphanumeric characters from the keypad, repeatedly press the appropriate key until the desired character is displayed in the first position. For example, to enter the letter *B*, press the *2* (ABC) key three times to toggle through the characters *1*, *A* and *B*. Press the right arrow key to move the cursor one position to the right and repeat the process to enter the next character. To enter a space, press the * *(QZ)* key four times until a blank appears in the desired position. When all characters have been entered, press the Enter key to store the information. The display will return to the Edit Detector Screen #5, displaying the new information at the bottom of the screen.

Recall/Increment Function

In addition, the user may use the Recall/Increment function at any time when the cursor is on the first letter of the Description, Adjective or Noun field as follows:

- If the zero key is pressed, a *0* is placed in the first letter position
- If the zero key is then pressed a second time with no intervening key actions, the entire field is replaced with the field entered *for the previous device programmed*, and the cursor moves to the last character of the field (Recall function). The Recalled Adjective or Noun field may now be changed letter-by-letter
- If the zero key is pressed again with no other intervening key actions and the last character in the field is a number *0-9*, the number is incremented by one. If the last character is a letter, it changes to a *0*. If the last character goes from *9* to *0* and the characters to the left of the last character are also numbers, they are also incremented (overflow)
- The above increment function may be repeated with each press of the zero key

As an example, the user could quickly enter 'FLR_3_ROOM_305' as follows:

1. The cursor is on the first letter of the Adjective field. Press the zero key twice to display *FLR_3*
2. With the cursor on the first letter of the Noun field, press the zero key twice to recall the display *ROOM_304*. The cursor automatically jumps from the first to the last letter of the Noun field
3. With the cursor on the last letter of the Noun field, press the zero key again to increment the room number to *305*
4. Press the Enter key to store the information

3.5.2 NAC (Notification Appliance Circuit)

```
  PROGRAMMING
1=INPUT ZONES
2=NACS
3=RELAYS
```

Programming Screen #1

The options for the NACs on the control panel main circuit board can be configured by pressing *2* while viewing Programming Screen #2. The following screens will be displayed:

```
        NACS
1=NAC 1        3=NAC 3
2=NAC 2        4=NAC 4
```

NAC Selection Screen

The Notification Appliance Circuits can be configured independently by pressing *1* for NAC 1, *2* for NAC 2, *3* for NAC 3 or *4* for NAC 4.

To program an NAC Input circuit, press the number corresponding to the NAC to be programmed. The following screens will be displayed for each selection:

```
        NAC #                ⇩
1=ENABLED              YES
2=CODING
   STEADY
```

NAC Screen #1

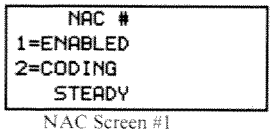
```
        NAC #                ⇧
1=SILENCE              YES
2=AUTO SILENCE          NO
3=SIL INHIBITED         NO
```

NAC Screen #2

3.5.2.1 Enabled

Pressing *1* while viewing NAC Screen #1 will cause the display to change to *Enabled No*. This will prevent the selected main circuit board NAC from activating its devices. Each press of the *1* key will cause the display to toggle between *Enabled Yes* and *Enabled No*.

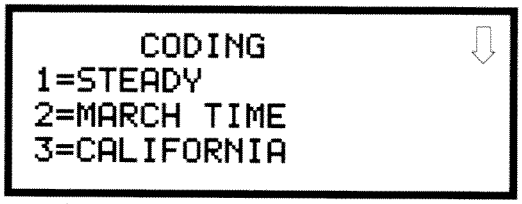
Note that if a circuit is disabled, a trouble will be logged on the FACP until the circuit is enabled.



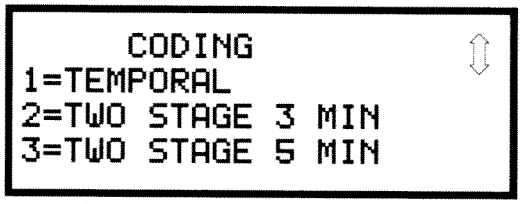
NAC Screen #1

3.5.2.2 NAC Coding

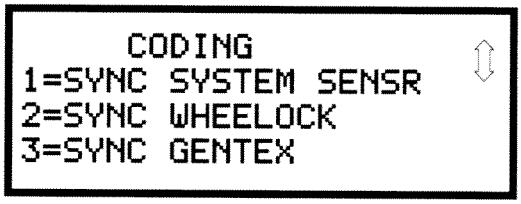
The Coding feature allows the programmer to select the type of output that the main circuit board notification appliances will generate when activated. Pressing *2* while viewing NAC Screen #1 will cause the following displays to appear:



Coding Screen #1



Coding Screen #2



Coding Screen #3

Coding Screen #4

The programmer can select the notification appliance output by pressing the number corresponding to the desired output. The coding selections are:

- Steady - a continuous output with no coding
- March Time - 120 ppm (pulse-per-minute) output
- California - 10 seconds on and 5 seconds off
- Temporal - ½ second on, ½ second off, ½ second on, ½ second off, ½ second on, 1½ second off
- Two Stage 3 Minutes or 5 Minutes - refer to "Two Stage Operation" on page 65 for a description of this feature
- Synchronized output for System Sensor, Wheelock, Gentex, Faraday or Amseco - Refer to "Synchronized NAC Operation" on page 65 for additional information

Selection of one of the above options will cause the control panel to store the information in memory and return the display to NAC Screen #1, which will display the new coding choice.

3.5.2.2.1 Two Stage Operation

Two Stage operation consists of the following:

- 1st stage output - 20 ppm (pulse-per-minute) coding
- 2nd stage output - Temporal coding as described above

If Two Stage operation is programmed as the Coding option, the following sequence of events will occur during an alarm.

1. The on-board NACs will activate with a 1st stage output upon activation of any alarm
2. If, after the programmed time of 3 or 5 minutes, the Acknowledge switch has not been pressed, all NACs presently in 1st stage activation will go to 2nd stage activation
3. If an Acknowledge switch has been pressed, any NACs currently in 1st stage activation will remain in 1st stage. Pressing the Acknowledge switch does not affect NACs already in 2nd stage activation
4. If another alarm point is activated and the countdown timer is counting, the alarm point will have no effect on the NACs
5. If another alarm point is activated and the countdown timer has stopped counting due to the Acknowledge switch being pressed, the countdown timer will restart and the NACs will respond as outlined in step 1. NACs already in 2nd stage activation will not be affected

3.5.2.2.2 Synchronized NAC Operation

Synchronization is a panel feature that controls the activation of notification appliances in such a way that all devices will turn on and off at exactly the same time. This is particularly critical when activating strobes which must be synchronized to avoid random activation and a potential hazard or confusion. The FACP can be programmed to operate with a variety of manufacturer's devices.

3.5.2.2.2.1 Maximum Number of Strobes for Synchronization

The maximum current draw for a Notification Appliance Circuit cannot exceed 3.0 amps for models with the FLPS-7 power supply (refer to the **AC Power** section under "Specifications" on page 13). Refer to the manufacturer's documentation supplied with the Strobes to determine the maximum current draw for each strobe and ensure that the circuit maximum is not exceeded.

To ensure proper strobe and circuit operation, there is also a limit to the number of strobes that can be attached to each circuit. Following is a list of the strobes that have been tested with this FACP and the maximum number that can be connected to each NAC. Make sure that the NAC maximum current is not exceeded:

Strobe Manufacturer	FACP with FLPS-7 Power Supply: Maximum Number of Strobes
System Sensor	46
Wheelock	50
Gentex	39
Faraday	33
Amseco	34

```
    NAC #
1=SILENCE       YES
2=AUTO SILENCE NO
3=SIL INHIBITED NO
```

NAC Screen #2

3.5.2.3 Silence

Pressing *1* while viewing NAC Screen #2 will cause the following screen to be displayed:

```
    SILENCEABLE
1=SILENCEABLE
2=NON SILENCEABLE
3=SYNC MUTE
```

Silenceable Screen

Pressing *1* while viewing the Silenceable Screen will program the selected NAC as a silenceable circuit. This will allow the NAC to be silenced by pressing the Alarm Silence key or by the Auto Silence feature.

Pressing *2* while viewing the Silenceable Screen will program the selected NAC as a nonsilenceable circuit. This will prevent the selected main circuit board NAC from being silenced by pressing the Alarm Silence key or by the Auto Silence feature.

Pressing *3* while viewing the Silenceable Screen will program the selected NAC as a synchronized mute circuit. Refer to "Synchronized NAC Operation" on page 65 for a description of synchronization.

***Important**: When a Notification Appliance Circuit with a mix of audible and visual devices is programmed for Sync Mute, only the audible devices will be turned off if the Silence key is pressed or if the Autosilence feature is enabled. The visual devices (strobes, etc.) will continue to operate.*

3.5.2.4 Auto Silence

The Auto Silence feature, when enabled, automatically silences all main circuit board silenceable notification appliances after a programmed length of time. To enable this feature and program the time delay before Auto Silence activation, press *2* while viewing NAC Screen #2. The following screens will be displayed:

```
PROGRAM NAC #
1=SILENCEABLE  YES
2=AUTO SILENCE  NO
3=SIL INHIBITED NO
```

NAC Screen #2

```
  AUTO SILENCE
1=NO
2=5 MINUTES
3=10 MINUTES
```

Auto Silence Screen #1

```
  AUTO SILENCE
1=15 MINUTES
2=20 MINUTES
3=25 MINUTES
```

Auto Silence Screen #2

```
  AUTO SILENCE
1=30 MINUTES
```

Auto Silence Screen #3

To disable the Auto Silence feature, press *1* for *No* while viewing Auto Silence Screen #1. To enable the Auto Silence feature, press the number corresponding to the time delay which will elapse before Auto Silence activates. This information will be stored in memory and the display will return to NAC Screen #1.

3.5.2.5 Silence Inhibited

The Silence Inhibit feature, when enabled, prevents the silencing of the selected main circuit board NAC for a period of one minute. Resetting the FACP will also be prevented for one minute while the NAC programmed for silence inhibit is activated. Pressing *3* while viewing NAC Screen #2 will cause the display to change from the factory default of *Silence Inhibit No* to *Silence Inhibit Yes*. Each press of the *3* key will cause the display to toggle between the two options.

3.5.3 Relays

```
  PROGRAMMING
1=INPUT ZONES
2=NACS
3=RELAYS
```

Programming Screen #1

Pressing *3* while viewing Programming Screen #1 will allow the programmer to configure the three main circuit board Form-C relays. The following screen will be displayed:

```
      RELAYS
1=RELAY 1    ALARM
2=RELAY 2    TROUBLE
3=RELAY 3    SUPERV
```

Relays Selection Screen

To program Relay 1, 2 or 3, press the number corresponding to the selected relay. The following screens will appear for each relay to be programmed:

Relay Screen #1

Relay Screen #3

Relay Screen #2

While viewing the selected screen, press the number corresponding to the desired relay type to program the main circuit board relay. The choice will be stored in memory and the display will return to the Relay Type Screen which will show the programmed type choice. Press the Escape key to return to the Relays Selection Screen and repeat the preceding procedure for the remaining relays.

Note: A relay programmed with the Silenceable Alarm type will ***deactivate*** *when the FACP Alarm Silenced LED is illuminated.*

3.5.4 System Setup

System Setup allows the programmer to configure the following control panel features:

- *Timers:* This option allows the programmer to set the PAS (Positive Alarm Sequence) time delay, Pre-Signal time delay and Waterflow time delay
- *Banner:* This option allows the user to change the top two lines of the LCD display from the factory default readout, which is blank, to a user defined readout when the control panel is in Normal condition
- *Time-Date:* This feature allows the programmer to set the time, display format (24 hr or 12 hr), date and daylight savings time feature into the FACP memory
- *Trouble Reminder*: This feature, when enabled, provides an audible reminder that an alarm or trouble still exists on the FACP after the control panel has been silenced. The control panel piezo sounder will pulse once every 15 seconds during an alarm and every two minutes during a trouble condition, after the Alarm Silence or Acknowledge key is pressed. The piezo will continue to sound at these rates until the alarm or trouble condition is cleared. If the *Trouble Reminder* feature is <u>not</u> enabled and a trouble condition is not cleared within 24 hours, the panel will reactivate the trouble sounder and retransmit the trouble condition to the central station if connected
- *Charger Disable:* This option allows the programmer to disable the onboard battery charger in the event an external battery charger is being used

```
  PROGRAMMING
1=SYSTEM SETUP
2=OPTION MODULES
3=HISTORY
```

Programming Screen #2

Pressing *1* for System Setup, while viewing Programming Screen #2, will cause the following screens to be displayed:

```
    SYSTEM SETUP      ⇩
1=TIMERS
2=BANNER
3=TIME-DATE
```

System Setup Screen #1

```
    SYSTEM SETUP      ⇧
1=TROUBLE REMIND  NO
2=FUTURE USE
3=CHARGR DISABLE  NO
```

System Setup Screen #2

3.5.4.1 Timers

Timer delays for PAS, Pre-signal and waterflow activation can be programmed by pressing *1* while viewing System Setup Screen #1. The following screen will be displayed:

```
   SYSTEM SETUP
1=TIMERS
2=BANNER
3=TIME-DATE
```

System Setup Screen #1

```
        TIMERS
1=PAS DELAY          120
2=PRE SIGNAL         120
3=WATERFLW DELAY       0
```

Timer Screen #1

```
        TIMERS
1=AC LOSS DELAY        2
```

Timer Screen #2

```
   TIMERS
1=PAS DELAY      120
2=PRE SIGNAL     120
3=WATERFLW DELAY   0
```

Timer Screen #1

3.5.4.1.1 PAS (Positive Alarm Sequence) Delay

The factory default setting for PAS is 000 for no delay. To select a PAS delay of 001 to 180 seconds for all devices programmed for PAS, press *1* while viewing Timer Screen #1. The following display will appear:

```
        PAS DELAY

RANGE 000-180 SECONDS
```

PAS Delay Screen

A flashing cursor is positioned in the lower left corner of the display. Enter a delay time consisting of three digits, such as 005 for five seconds. Upon entering the third digit, the time delay will be stored in the control panel memory and the display will return to the Delay Screen which will indicate the new delay time.

3.5.4.1.2 Pre-signal Delay

The factory default setting for Pre-signal delay is 000 for no delay. To select a Pre-signal delay of 001 to 180 seconds for all devices programmed for Pre-signal, press *2* while viewing Timer Screen #1. The following screen will be displayed:

```
     PRESIGNAL DELAY

RANGE 000-180 SECONDS
```

Pre-signal Delay Screen

A flashing cursor is positioned in the lower left corner of the display. Enter a delay time consisting of three digits, such as 009 for nine seconds. Upon entering the third digit, the time delay will be stored in the control panel memory and the display will return to the Delay Screen which will indicate the new delay time.

Note that the FACP can have both PAS and Pre-signal timers programmed with values but a zone can only use either the PAS or Pre-signal feature, but not both.

```
  TIMER
1=PAS DELAY     120
2=PRE SIGNAL    120
3=WATERFLW DELAY  0
```
Timer Screen #1

3.5.4.1.3 Waterflow Delay

A delay can be added prior to declaring a waterflow type of alarm. Be careful to include any built-in delays of the waterflow device. The factory default setting for Waterflow delay is 000 for no delay. To select a Waterflow delay of 01 to 90 seconds for all devices programmed for Waterflow delay, press *3* while viewing Timer Screen #1. The following screen will be displayed:

```
  WATERFLOW DELAY

RANGE 00-90 SECONDS
```
Waterflow Delay Screen

A flashing cursor is positioned in the lower left corner of the display. Enter a delay time consisting of two digits, such as 25 for twenty-five seconds. Upon entering the second digit, the time delay will be stored in the control panel memory and the display will return to the Delay Screen which will indicate the new delay time.

```
  TIMER
1=AC LOSS DELAY 2
```
Timer Screen #2

3.5.4.1.4 AC Loss Delay

The reporting of a loss of AC power to a central station can be delayed by programming the length of the desired delay. Press *1* while viewing Timer Screen #2 to display the following:

```
 AC LOSS DELAY

RANGE 00-23 HOURS
```
AC Loss Delay Screen #1

A flashing cursor will appear in the lower left corner of the display. The factory default setting is 02 hours. Type the two digit AC loss reporting delay in hours (00 to 23 hour delay). When the second digit is entered, the display will return to AC Loss Delay Screen #1.

Note: Upon the loss of AC power at the control panel, relays programmed for AC Loss will transfer immediately, regardless of the *AC Loss Delay* setting. If no troubles other than AC Loss exist in the panel, the System Trouble relay will delay activation for the duration of the *AC Loss Delay* setting.

3.5.4.2 Banner

The top line of the display, which appears when the control panel is in normal mode, can be changed by using the Banner option. Pressing *2* while viewing System Setup Screen #1 will cause the following to be displayed:

```
SYSTEM SETUP
1=TIMERS
2=BANNER
3=TIME-DATE
```

System Setup Screen #1

```
SELECT BANNER
1=FACTORY BANNER
2=USER BANNER
```

Select Banner Screen

Pressing *1* while viewing the Select Banner Screen will display the following screen:

```
FACTORY BANNER

PRESS ENTER IF OK
```

User Defined Banner Screen #1

This screen allows the user to select the factory default Banner which will be displayed when the system is in Normal Mode of operation. Press the Enter key to accept this as the default display. Press the Escape key to cancel and return to the Select Banner Screen.

Pressing *2* wile viewing the Select Banner Screen will display the following screen:

```
USER BANNER-LINE 1

PRESS ENTER IF OK
```

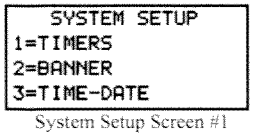
User Defined Banner Screen

This screen allows the programmer to enter a custom banner. A flashing cursor will appear in the bottom left corner of the display. A maximum of 20 characters (including spaces) can be entered into the screen. After entering up to 20 characters in the screen, press *Enter* to store the entry. To quickly clear the current banner, press the *CLR* key.

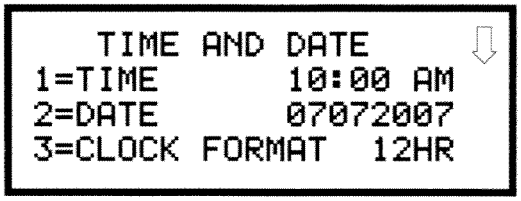
To enter alphanumeric characters from the keypad, repeatedly press the appropriate key until the desired character is displayed in the first position. For example, to enter the letter *B*, press the *2 (ABC)* key three times to toggle through the characters *1*, *A* and *B*. Press the right arrow key to move the cursor one position to the right and repeat the process to enter the next character. To enter a space, press the ** (QZ)* key four times to place a blank in the desired position. When all characters have been entered, press the *Enter* key to store the information. The display will return to the Select Banner Screen.

3.5.4.3 Time-Date

The control panel time and date can be changed by pressing *3* while viewing the System Setup Screen #1. The following screen will be displayed:



System Setup Screen #1

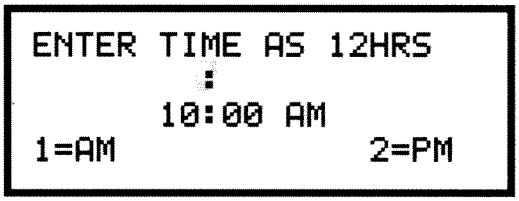


Time-Date Screen #1

Time-Date Screen #2

3.5.4.3.1 Time

To change the time, press *1* while viewing the Time-Date Screen. The following screen will be displayed:



Time Screen

A flashing cursor is located toward the top left of the display. Below the cursor is the current time. To change the time, enter the two-digit hours followed by the two-digit minutes. The cursor will move one position to the right each time a digit is entered. After the last minutes digit is entered, the cursor will again move one position to the right. At this point enter *1* for AM or *2* for PM. The display will then return to the Time-Date Screen which will show the new time entry. If an error is made while entering a digit, press the *CLR* key to delete the entire entry and beginning again.

3.5.4.3.2 Date

To change the date, press *2* while viewing the Time-Date Screen. The following screen will be displayed:

Date Screen

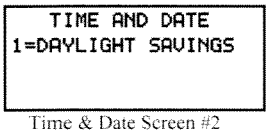
A flashing cursor is located toward the top left of the display. Below the cursor is the current date. To change the date, enter the two-digit month followed by the two-digit day and then the two-digit year (07 for 2007, 08 for 2008, etc.). The cursor will move one position to the right each time a digit is entered. After the last year digit is entered, the display will return to the Time-Date Screen which will show the new date entry. If an error is made while entering a digit, press the *CLR* key to delete the entire entry and beginning again.

3.5.4.3.3 Clock Format

The clock can be configured to display 12 hour (AM & PM) or 24 hour (military) time. Pressing *3* while viewing the Time-Date screen will cause the display to toggle between 12HR and 24HR. Select 12HR for 12 hour display or 24HR for 24 hour display.
Note: If the clock is changed to 24 hour (military) format, the date will change to the European standard of ***Day-Month-Year*** *(for display purposes only).*

3.5.4.3.4 Daylight Savings Time

Pressing *1* while viewing Time-Date Screen #2 will cause the following screens to be displayed:



Time & Date Screen #2

Daylight Savings Screen #1

Daylight Savings Screen #2

Pressing *1* while viewing Daylight Savings Screen #1 will cause the display to toggle between *Enabled Yes* and *Enabled No*. The control panel will automatically update the time for daylight savings time when *Enabled Yes* is selected.

Pressing *2* while viewing Daylight Savings Screen #1 will display another screen which allows the programmer to select the month that daylight savings time will begin. In this sub-screen, pressing *1* will select March, *2* will select April and *3* will select May.

Pressing *3* while viewing Daylight Savings Screen #1 will display two sub-screens which allow the programmer to select the week of the month that daylight savings time will begin. In the first sub-screen, pressing *1* will select the first week, *2* will select the second week and *3* will select the third week, while in the second sub-screen, pressing *1* will select the fourth week and *2* will select the last week of the selected month.

Pressing *1* while viewing Daylight Savings Screen #2 will display another screen which allows the programmer to select the month that daylight savings time will end. In this sub-screen, pressing *1* will select September, *2* will select October and *3* will select November.

Pressing 2 while viewing Daylight Savings Screen #2 will display two sub-screens which allow the programmer to select the week of the month that daylight savings time will end. In the first sub-screen, pressing *1* will select the first week, *2* will select the second week and *3* will select the third week, while in the second sub-screen, pressing *4* will select the fourth week and *5* will select the last week of the selected month.

```
   SYSTEM SETUP
1=TROUBLE REMIND  NO
2=FUTURE USE
3=CHARGR DISABLE NO
```
System Setup Screen #2

See Page

3.5.4.4 Trouble Reminder

The Trouble Reminder features causes the control panel piezo to sound a reminder 'beep' for alarms and troubles, after the panel has been silenced. Refer to "System Setup" on page 69, for a detailed description of this feature. Pressing *1* while viewing System Setup Screen #2 will cause the display to toggle to *Trouble Rem Yes*, which enables this feature. Each press of the *1* key will cause the display to toggle between *Trouble Rem Yes* and *Trouble Rem No*.

Note that if the Trouble Reminder feature is not enabled, a trouble existing on the panel for more than 24 hours will cause the FACP to resound the trouble sounder.

3.5.4.5 Charger Disable

Pressing 3 while viewing System Setup Screen #2 will allow the programmer to enable or disable the onboard battery charger. If an external battery charger is being used, the onboard battery charger must be disabled. Each press of the 3 key will toggle between *Chrgr Disable No* and *Chrgr Disable Yes*.

```
   PROGRAMMING
1=SYSTEM SETUP
2=OPTION MODULES
3=HISTORY
```
Programming Screen #2

3.5.5 Option Modules

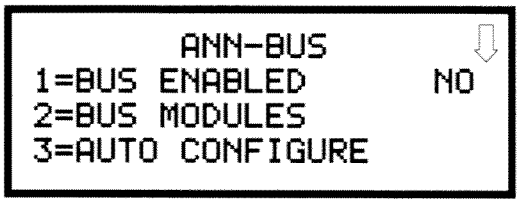
Options available for the FACP include annunciators, printer connection for acquiring hardcopy printouts of panel data and onboard DACT.

Pressing *2* while viewing Programming Screen #2 will display the following screen:

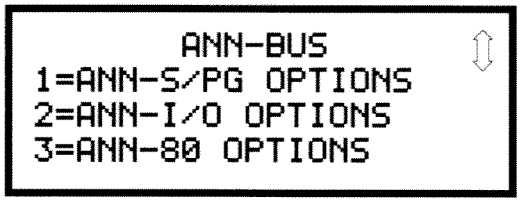
```
   OPTION MODULES
1=ANN-BUS
2=ON BOARD DACT
```
Options Screen

3.5.5.1 ANN-BUS

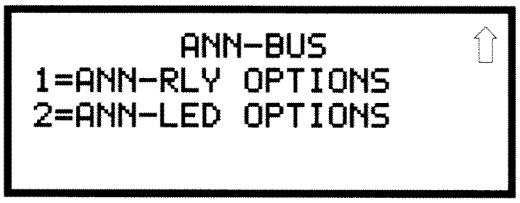
Pressing *1* while viewing the Option Modules screen will cause the control panel to display the following screens.



ANN-BUS Screen #1



ANN-BUS Screen #2



ANN-BUS Screen #3

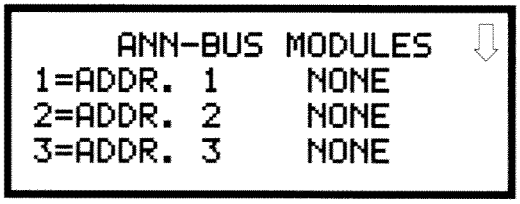
A variety of ANN-BUS option modules can be installed in the FACP. These devices communicate with the FACP over the ANN-BUS terminals on the control panel.

3.5.5.1.1 ANN-BUS Enabled

The ANN-BUS must be enabled if any modules are installed on the ANN-BUS terminals. To enable the ANN-BUS, press *1* while viewing ANN-BUS screen #1 so that the display reads *ANN-BUS Enabled Yes*. Each press of the *1* key will cause the display to toggle between *ANN-BUS Enabled Yes* and *ANN-BUS Enabled No*.

3.5.5.1.2 BUS Modules

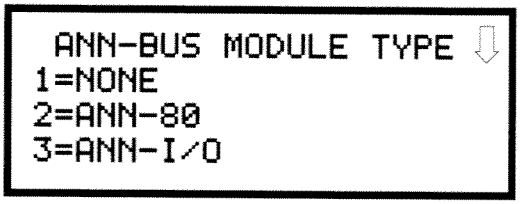
If an ANN-BUS module is installed, press 2 while viewing ANN-BUS screen #1 to select ANN-BUS addresses for the module(s). The following screen will be displayed.



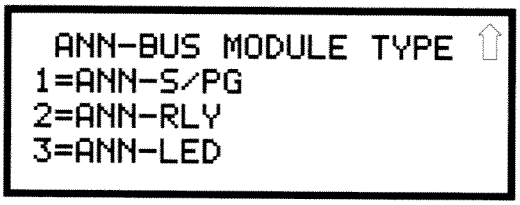
On Board DACT Screen #1

Pressing the down arrow key will allow the programmer to view additional screens displaying Addresses 1 - 8. Pressing the number corresponding to the desired address will display a screen with technical information about the selected module.

In the technical information screen, pressing *1* for *Type* will display the following screens:



Module Type Screen #1



Module Type Screen #2

Press the number corresponding to the module type, if any, that is installed with the selected address. ***This will enable the module***.

3.5.5.1.3 Auto-Configure

The ANN-BUS Auto-Configure features allows the programmer to quickly bring all installed ANN-BUS modules online. The software will search for all ANN-BUS modules and automatically program the device type and address into the system. Pressing *3* while viewing ANN-BUS Screen #1 will begin the Auto-Configure process and cause the following screen to be displayed:

Auto-Configure Screen

3.5.5.1.4 ANN-S/PG Options Screen

The Printer Option allows the user to configure the optional printer. Pressing *1* while viewing the ANN-BUS Screen #2 will display the following screens:

```
PROGRAMMING
1=ANN-S/PG OPTIONS
2=ANN-I/O OPTIONS
3=ANN-80 OPTIONS
```

ANN-BUS Screen #2

```
  ANN-S/PG OPTIONS  ⇩
1=PORT          PARALLEL
2=PRINTER SUPV        NO
3=OFFLINE TIMER       60
```

Printer Options Screen #1

```
  ANN-S/PG OPTIONS  ⇧
1=BAUD RATE          N/A
2=DATA BITS          N/A
3=PARITY             N/A
```

Printer Options Screen #2

```
  ANN-S/PG OPTIONS  ⇧
1=STOP BITS          N/A
```

Printer Options Screen #3

Pressing *1* for Port while viewing Printer Options screen #1 will allow the programmer to select between a Parallel and Serial Port for printer connection. Each press of the *1* key will cause the display to toggle between *Port PAR* (parallel) and *Port SER* (serial). It is important to note that the interface selected determines which options are available to the user.

If the Parallel Port option is selected, the user has the option to supervise the printer and select an offline timer for the supervision by pressing *2* for Printer Supervision while viewing Print Options screen #1. Each press of the *2* key will cause the display to toggle between *Printer Supv NO* for no supervision and *Printer Supv YES* for printer supervision. Note that this option is not selectable if the Serial Port option has been selected.

If the Parallel Port option is selected, the user has the ability to select an *Offline Timer* by pressing *3* while viewing Print Options screen #1. The resultant screen allows the programmer to program the *Offline Timer* for a delay of between 0 and 255 seconds before loss of printer supervision is reported as a trouble.

If the Serial Port option is selected, the *Printer Supv* and *Offline Timer* options will not be available. The Baud Rate, Data Bits, Parity and Stop Bits options are only available when the Serial Port option has been selected.

Pressing *1* for *Baud Rate* while viewing Printer Options screen #2 will cause a screen to appear which allow the user to select a Baud Rate of *19200, 9600 or 2400.*

Pressing *2* for *Data Bits* while viewing Printer Options screen #2 will cause screens to appear which allow the user to select *5, 6, 7* or *8 Data Bits.*

Pressing *3* for *Parity* while viewing Printer Options screen #2 will cause a screen to appear which allows the user to select between *No Parity, Even Parity* or *Odd Parity.*

Pressing *1* for Stop Bits while viewing Printer Options screen #3 will cause a screen to appear which allows the user to select between *0.5, 1.0* or *2.0 Stop Bits.*

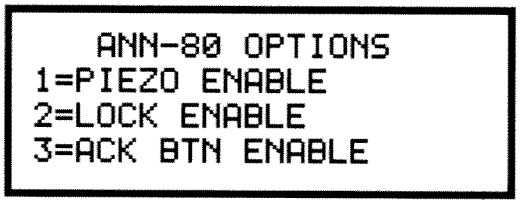
3.5.5.1.5 GFANN-I/O LED Zone Assignments

The information displayed by LEDs on every GFANN-I/O module is not programmable and will therefore be as indicated in the following table.

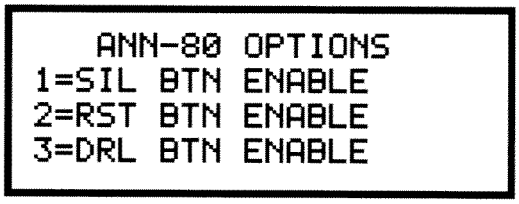
LED	Zone (any address)
1	AC Fault
2	General Alarm
3	General Supervisory
4	General Trouble
5	Alarm Silenced
6	Not Used
7	Not Used
8	Not Used
9	Not Used
10	Not Used
11	Zone 1 Alarm
12	Zone 2 Alarm
13	Zone 3 Alarm
14	Zone 4 Alarm
15	Zone 5 Alarm
16	Zone 6 Alarm
17	Zone 7 Alarm
18	Zone 8 Alarm
19	Zone 9 Alarm
20	Zone 10 Alarm
21	Zone 1 Trouble
22	Zone 2 Trouble
23	Zone 3 Trouble
24	Zone 4 Trouble
25	Zone 5 Trouble
26	Zone 6 Trouble
27	Zone 7 Trouble
28	Zone 8 Trouble
29	Zone 9 Trouble
30	Zone 10 Trouble
31	Zone 1 Supervisory
32	Zone 2 Supervisory
33	Zone 3 Supervisory
34	Zone 4 Supervisory
35	Zone 5 Supervisory
36	Zone 6 Supervisory
37	Zone 7 Supervisory
38	Zone 8 Supervisory
39	Zone 9 Supervisory
40	Zone 10 Supervisory

3.5.5.1.6 ANN-80 Options Screen

Pressing 2 while ANN-BUS screen #2 will display the following screen:



ANN-80 Options Screen #1



ANN-80 Options Screen #2

The *Piezo Enable* option allows the programmer to select whether the piezo sounder on any installed GFANN-80 module will ever sound. Pressing *1* while viewing the ANN-80 Options Screen #1 causes the display to toggle between *Piezo Enable Yes* and *Piezo Enable No*.

The *Lock Enable* option allows the programmer to select whether or not the GFANN-80 annunciator must be unlocked by its key before any annunciator key presses will function. Pressing *2* while viewing the ANN-80 Options Screen #1 causes the display to toggle between *Lock Enable Yes* (annunciator must be unlocked for keys to function) and *Lock Enable No* (lock position is ignored).

The Acknowledge Button Enable (*ACK BTN ENABLE*) option allows the programmer to select whether the Ack/Step button on any installed GFANN-80 annunciator will function normally or always be ignored. Pressing *3* while viewing the ANN-80 Options Screen #1 causes the display to toggle between *Ack Btn Enable Yes* (Ack/Step button functions normally) and *Ack Btn Enable No* (Ack/Step button never functions).

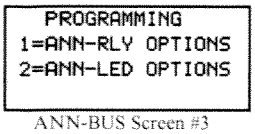
The Silence Button Enable (*SIL BTN ENABLE*) option allows the programmer to select whether the Silence button on any installed GFANN-80 annunciator will function normally or always be ignored. Pressing *1* while viewing the ANN-80 Options Screen #2 causes the display to toggle between *Sil Btn Enable Yes* (Silence button functions normally) and *Sil Btn Enable No* (Silence button never functions).

The Reset Button Enable (*RST BTN ENABLE*) option allows the programmer to select whether the Reset button on any installed GFANN-80 annunciator will function normally or always be ignored. Pressing *2* while viewing the ANN-80 Options Screen #2 causes the display to toggle between *Rst Btn Enable Yes* (Reset button functions normally) and *Rst Btn Enable No* (Reset button never functions).

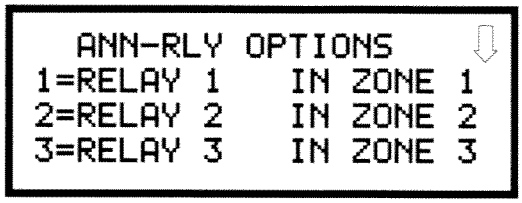
The Drill Button Enable (*DRL BTN ENABLE*) option allows the programmer to select whether the Drill button on any installed GFANN-80 annunciator will function normally or always be ignored. Pressing *3* while viewing the ANN-80 Options Screen #2 causes the display to toggle between *Drl Btn Enable Yes* (Drill button functions normally) and *Drl Btn Enable No* (Drill button never functions).

3.5.5.2 ANN-RLY Options Screen

Pressing *1* for *ANN-RLY Options* while viewing ANN-BUS Screen #3 will cause the following screen to be displayed:



ANN-BUS Screen #3



ANN-RLY Options Screen

The GFANN-RLY module provides ten Form-C relays which can be programmed for various functions. The initial screen displays Relays 1 through 3. Pressing the down arrow key will display the remaining relays for this module.

To program any of the GFANN-RLY relays, while viewing the appropriate ANN-RLY Option screen, press the number key corresponding to the relay to be programmed. Following is a list of the available programming options for each relay:

- General Alarm
- General Trouble
- General Supervisory
- AC Loss
- Waterflow Delay
- Input Zone 1
- Input Zone 2
- Input Zone 3
- Input Zone 4
- Input Zone 5
- Input Zone 6
- Input Zone 7
- Input Zone 8
- Input Zone 9
- Input Zone 10
- Silenceable Alarm
- Not Assigned

3.5.5.3 Onboard DACT

The Onboard DACT (Digital Alarm Communicator/Transmitter) provides communication to a central station. Pressing *2* while viewing the Option Module Screen will cause the following screens to be displayed:

```
   OPTION MODULES
1=ANN-BUS
2=ON BOARD DACT
```

Option Module Screen

```
    ON BOARD DACT    ⇧
1=PRIM PHONE   TCH TNE
2=SCND PHONE   TCH TNE
3=CENTRAL STATION
```

3.5.5.3.1 Primary Phone

Press *1* while viewing Onboard DACT Screen to program the type of primary phone line being connected to the DACT. The following screen will be displayed:

```
    PHONE LINE
1=TOUCHTONE
2=ROTARY 67/33 (EURO)
3=ROTARY 60/40 (U.S.)
```

Primary Phone Type Screen

Press *1* to select Touchtone dialing, *2* to select Rotary dialing with a make/break ratio of 67/33 or *3* to select Rotary dialing with a make/break ratio of 60/40.

```
  ON BOARD DACT
1=PRIM PHONE
2=SCND PHONE
3=CENTRAL STATION
```

Onboard DACT

3.5.5.3.2 Secondary Phone

Press *2* while viewing Onboard DACT Screen to program the type of secondary phone line being connected to the DACT. The following screen will be displayed:

```
    PHONE LINE
1=TOUCHTONE
2=ROTARY 67/33 (EURO)
3=ROTARY 60/40 (U.S.)
```

Secondary Phone Type Screen

Press *1* to select Touchtone dialing, *2* to select Rotary dialing with a make/break ratio of 67/33 or *3* to select Rotary dialing with a make/break ratio of 60/40.

3.5.5.3.3 Central Station

Central Station programming configures the control panel DACT for contacting the central station. Pressing *3* while viewing Onboard DACT Screen will cause the following screens to be displayed:

```
  CENTRAL STATION      ⇩
1=REPORTING          NO
2=REPORT STYLE
          BACKUP ONLY
```

Central Station Screen #1

```
  CENTRAL STATION      ⇧
1=PRIMARY
2=SECONDARY
```

Central Station Screen #2

3.5.5.3.3.1 Reporting

To enable the DACT for reporting FACP activity to the central station, press *1* while viewing Central Station Screen #1 so the display reads *Reporting Yes*. Each press of the *1* key will toggle the display between *Reporting Yes* and *Reporting No*.

3.5.5.3.3.2 Report Style

The DACT can be programmed to transmit reports to primary and/or secondary central station phone numbers as a backup. Press *2* while viewing Central Station Screen #1 to display the following screen:

```
    REPORT STYLE
1=BACKUP ONLY
2=BOTH
3=FIRST AVAILABLE
```

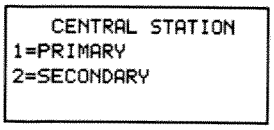
Backup Reporting Screen

Press *1* to have all reports transmitted to the central station secondary phone number as a backup only if the primary phone line fails, *2* to transmit all reports to both the primary and secondary phone numbers all of the time or *3* to send reports to the first available phone number.

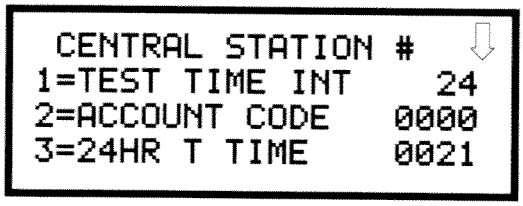
3.5.5.3.3.3 Central Station Primary and Secondary Phone Numbers

Pressing *1* for Primary or *2* for Secondary, while viewing Central Station Screen #2, will display the following screens.

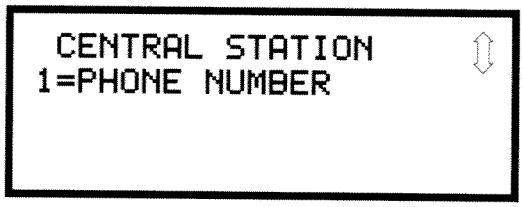
Note that the following information must be entered for both the Primary and Secondary Central Station Phone Numbers.



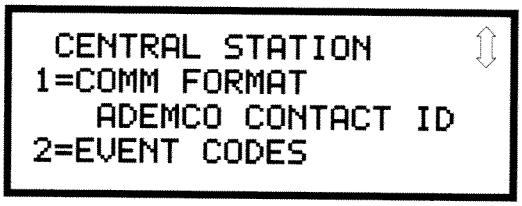
Central Station Screen #2



Primary/Secondary Screen #1



Primary/Secondary Screen #2



Primary/Secondary Screen #3

Test Time Interval

Pressing *1* while viewing Primary/Secondary Screen #1 will cause the following screens to be displayed:

```
  CENTRAL STATION
1=TEST TIME INT
2=ACCOUNT CODE
3=24HR TST TIME
```

Primary/Secondary Screen #1

```
  TEST TIME INTERVAL ⇩
1=24 HOURS
2=12 HOURS
3=8 HOURS
```

Test Time Interval Screen #1

```
  TEST TIME INTERVAL ⇧
1=6 HOURS
```

Test Time Interval Screen #2

The test report sent to the Central Station phone number may be sent once every 6, 8, 12 or 24 hours. Select the desired Test Time Interval by pressing the corresponding digit in the screens shown above.

Account Code

Pressing *2* while viewing Primary/Secondary Screen #1 will cause the following screen to be displayed:

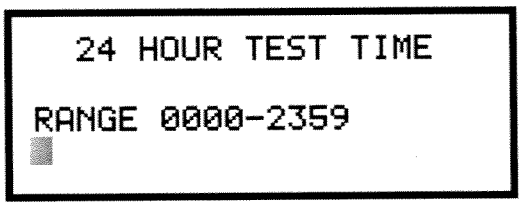
```
  ACCOUNT CODE

RANGE 0000-FFFF
```

Account Codes Screen

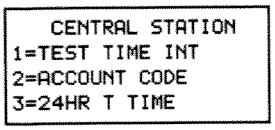
The Account Code, which is assigned by a Central Station, depends on the communication format being used. The Account Code screen will have a flashing cursor in the lower left corner. Program the supplied 4-digit account code using 0 - 9 and A - F keys. Enter the first digit, then press the right arrow key to move the cursor to the right, one position. Repeat the process until all digits are entered.

24 Hour Test Time

Pressing 3 while viewing Primary/Secondary Screen #1 will cause the following screen to be displayed:



24 Hour Test Time Screen

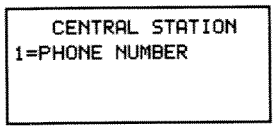


Primary/Secondary Screen #1

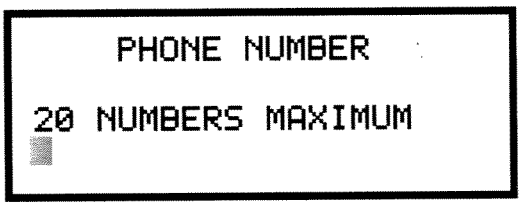
Use the 24 Hour Test Time screen to program the time that the DACT will transmit the 24 Hour Test to the Central Station. A flashing cursor will appear in the lower left corner of the screen. Enter a four digit number representing the test time using military time (0000 = midnight and 2359 = 11:59PM).

Phone Number

Pressing *1* while viewing Primary/Secondary Screen #2 will cause the following screen to be displayed:



Primary/Secondary Screen #2



Phone Number Screen

The Phone Number screen is used to enter the Central Station phone number that the DACT will be contacting. A maximum of 20 characters can be entered with valid entries being 0 - 9 and A - F where A = *, B = #, C = look for secondary dial tone for up to 2 seconds (then dial anyway), D = 3 second pause, E = 5 second pause and F = end of phone number (must be entered at end of phone number).

A flashing cursor will appear in the lower left corner of the screen. Enter the first digit then press the right arrow key to move the cursor to the right one position. Enter the second digit and repeat the process until all digits are entered. Press the *Enter* key to store the phone number in memory.

Enter the digits as you would like the number to be dialed. For example, if it's necessary to dial 9 before dialing a number outside the building, you may wish to pause after dialing 9. Enter *9* followed by *D* for a three second pause or *E* for a five second pause then the phone number followed by an F to indicate the end of the number.

Communication Format

Pressing *1* while viewing Primary/Secondary Screen #3 will cause the following screen to be displayed:

```
CENTRAL STATION
1=COMM FORMAT
```

Primary/Secondary Screen #3

```
    COMM FORMAT
1=ADEMCO CONTACT ID
2=SIA-DCS-8
3=SIA-DCS-20
```

The Communication Format is determined by the type of receiver that the DACT is transmitting to. *Consult your Central Station for proper selection or consult our factory representatives. For any format chosen, the control panel automatically programs all of the event codes.*

Select the Communication Format by pressing the corresponding number key while viewing the Comm Format screen. The following table describes each format:

Table 3.1 Communication Formats

Screen Selection	Communication Format Description
ADEMCO CONTACT ID	Contact ID, DTMF, 1400/2300 ACK
SIA-DCS-8	Security Industry Association, 8 messages per call
SIA-DCS-20	Security Industry Association, 20 messages per call

Event Codes

Pressing *1* while viewing Primary/Secondary Screen #4 will cause the following screen to be displayed:

```
CENTRAL STATION
1=EVENT CODES
```

Primary/Secondary Screen #4

```
 EVENT CODES                ⇩
1=ZONE 1 ALARM
2=ZONE 2 ALARM
3=ZONE 3 ALARM
```

Event Code Screen

Pressing the down arrow key allows viewing of all Events associated with the selected Communication Format. Pressing the number corresponding to the event displayed in each screen will display its default active and restoral event codes which can be customized by the programmer.

For example, if Ademco Contact ID is the selected format, pressing *3* for Zone 3 Alarm will display the following screen which allows the Event Code to be changed from the default value.

```
ZONE 3 ACTIVE
                115
```

The following table lists the Zone Alarm Types that can be programmed for zones 1 through 10 and the corresponding Event Codes for Ademco Contact ID and SIA DCS Formats. Note that Table 3.3 on page 89, Table 3.4 on page 90, Table 3.5 on page 91 and Table 3.6 on page 93 list the default settings for Zone 1 through Zone 10. These can be changed to any of the Types listed in Table 3.2 .

Note: The third character in the SIA-DCS Format (*x* in the table below) represents the zone number.

Table 3.2 Zone Alarm Type Event Codes

Zone Alarm Type	Ademco Contact ID	SIA-DCS Format	
	Active	Active	Restoral
Pull-Station	115	FAx	FHx
Waterflow	113	SAx	SHx
Waterflow Nonsilenceable	113	SAx	SHx
Combo	113	SAx	SHx
Combo AutoResettable Supervisory	113	SAx	SHx
2-Wire Detector	111	FAx	FHx
Normally Open Contact	110	UAx	UHx
Fire	110	FAx	FHx
Tamper	144	TAx	THx
Supervisory	200	FSx	FVx
Supervisory AutoResettable	200	FSx	FVx
Medic-Alert	100	MAx	MHx
Hazard-Alert	150	PAx	PHx
Tornado-Alert	150	PAx	PHx
Proc-Mon	200	IAx	IRx
Procmon-AR	200	IAx	IRx
AC-Loss-Mon	301	ATx	ARx
Drill-Switch	604	FIx	FKx
Drill-Switch AutoResettable	604	FIx	FKx

The following tables list all of the Events and their default Event Codes for the Ademco Contact ID and SIA-DCS Communication Formats.

Note: A detector *freeze* condition will be reported as a Supervisory Event Code.

Ademco Contact ID Format - Primary Central Station Phone Number

The information shown in Table 3.3 is automatically programmed for the Primary Central Station phone number Event Codes when Ademco Contact ID Format is selected. To disable event reporting, select the desired Event Code to be disabled and press ***0*** or ***Clear*** and then ***Enter*** to disable it. (***Enter*** must be pressed to save the selection. Pressing ***Escape*** will not save the selection). *Note that disabling the Event Code for the Primary Central Station Phone Number Event Code will also disable that Event Code for the Secondary Central Station Phone.*

Table 3.3 Ademco Contact ID Primary # Event Codes

Event Description	Event Code Settings Active
Primary # Zone 1 - 10 Alarm	115
Primary # Zone 1 - 10 Disabled	570
Primary # Drill	604
Primary # AC Fault	301
Primary # Zone 1 - 10 Fault	380
Primary # Zone 1 - 10 Dirty	380
Primary # Earth Fault	310
Primary # Low Battery Fault	302
Primary # No Battery Fault	311
Primary # Telco Primary Line Fault	351
Primary # Telco Secondary Line Fault	352
Primary # NAC #1 Fault	321
Primary # NAC #2 Fault	322
Primary # NAC #3 Fault	326
Primary # NAC #4 Fault	327
Primary # NAC #1 Disable	521
Primary # NAC #2 Disable	522
Primary # NAC #3 Disable	526
Primary # NAC #4 Disable	527
Primary # Charger Fault	300
Primary # Comm Trouble Primary #	354
Primary # Comm Trouble Secondary #	354
Primary # Printer Fault	336
Primary # ANN-Bus Fault	330
Primary # Option Card Fault	333
Primary # Memory Fault	304
Future	000
Primary # System Off Normal	308
Primary # System Test Message	602
Primary # System Abnormal Test Message	608

Ademco Contact ID Format - Secondary Central Station Phone Number

The information shown in Table 3.4 is automatically programmed for the Secondary Central Station phone number Event Codes when Ademco Contact ID Format is selected. To disable event reporting, select the desired Event Code to be disabled and press ***0*** or ***Clear*** and then ***Enter*** to disable it. (***Enter*** must be pressed to save the selection. Pressing ***Escape*** will not save the selection). *Note that disabling the Event Code for the Primary Central Station Phone Number Event Code will also disable that Event Code for the Secondary Central Station Phone.*

Table 3.4 Ademco Contact ID Secondary # Event Codes

Event Description	Event Code Settings Active
Secondary # Zone 1 - 10 Alarm	115
Secondary # Zone 1 - 10 Disabled	570
Secondary # Drill	604
Secondary # AC Fault	301
Secondary # Zone 1 - 10 Fault	380
Secondary # Zone 1 - 10 Dirty	380
Secondary # Earth Fault	310
Secondary # Low Battery Fault	302
Secondary # No Battery Fault	311
Secondary # Telco Primary Line Fault	351
Secondary # Telco Secondary Line Fault	352
Secondary # NAC #1 Fault	321
Secondary # NAC #2 Fault	322
Secondary # NAC #3 Fault	326
Secondary # NAC #4 Fault	327
Secondary # NAC #1 Disable	521
Secondary # NAC #2 Disable	522
Secondary # NAC #3 Disable	526
Secondary # NAC #4 Disable	527
Secondary # Charger Fault	300
Secondary # Comm Trouble Primary #	354
Secondary # Comm Trouble Secondary #	354
Secondary # Printer Fault	336
Secondary # ANN-BUS Fault	330
Secondary # Option Card Fault	331
Secondary # Memory Fault	304
Future	000
Secondary # System Off Normal	308
Secondary # System Test Message	602
Secondary # System Abnormal Test Message	608

SIA-DCS Format - Primary Central Station Phone Number

The information shown in Table 3.5 is automatically programmed for the Primary Central Station phone number Event Codes when SIA-DCS Format is selected. To disable event reporting, select the desired Event Code to be disabled and press ***0*** or ***Clear*** and then ***Enter*** to disable it. (***Enter*** must be pressed to save the selection. Pressing ***Escape*** will not save the selection). *Note that disabling the Event Code for the Primary Central Station Phone Number Event Code will also disable that Event Code for the Secondary Central Station Phone.*

Table 3.5 SIA-DCS Primary # Event Codes

Event Description	Event Code Settings	
	Active	Restoral
Primary # Zone 1 Alarm	FA1	FH1
Primary # Zone 2 Alarm	FA2	FH2
Primary # Zone 3 Alarm	FA3	FH3
Primary # Zone 4 Alarm	FA4	FH4
Primary # Zone 5 Alarm	FA5	FH5
Primary # Zone 6 Alarm	FA6	FH6
Primary # Zone 7 Alarm	FA7	FH7
Primary # Zone 8 Alarm	FA8	FH8
Primary # Zone 9 Alarm	FA9	FH9
Primary # Zone 10 Alarm	FA10	FH10
Primary # Zone 1 Disabled	FB1	FU1
Primary # Zone 2 Disabled	FB2	FU2
Primary # Zone 3 Disabled	FB3	FU3
Primary # Zone 4 Disabled	FB4	FU4
Primary # Zone 5 Disabled	FB5	FU5
Primary # Zone 6 Disabled	FB6	FU6
Primary # Zone 7 Disabled	FB7	FU7
Primary # Zone 8 Disabled	FB8	FU8
Primary # Zone 9 Disabled	FB9	FU9
Primary # Zone 10 Disabled	FB10	FU10
Primary # Drill	FI	FK
Primary # AC Fault	AT	AR
Primary # Zone 1 Fault	FT1	FJ1
Primary # Zone 2 Fault	FT2	FJ2
Primary # Zone 3 Fault	FT3	FJ3
Primary # Zone 4 Fault	FT4	FJ4
Primary # Zone 5 Fault	FT5	FJ5
Primary # Zone 6 Fault	FT6	FJ6
Primary # Zone 7 Fault	FT7	FJ7
Primary # Zone 8 Fault	FT8	FJ8
Primary # Zone 9 Fault	FT9	FJ9
Primary # Zone 10 Fault	FT10	FJ10
Primary # Zone 1 Dirty	FT1	FJ1
Primary # Zone 2 Dirty	FT2	FJ2
Primary # Zone 3 Dirty	FT3	FJ3

Table 3.5 SIA-DCS Primary # Event Codes (Continued)

Primary # Zone 4 Dirty	FT4	FJ4
Primary # Zone 5 Dirty	FT5	FJ5
Primary # Zone 6 Dirty	FT6	FJ6
Primary # Zone 7 Dirty	FT7	FJ7
Primary # Zone 8 Dirty	FT8	FJ8
Primary # Zone 9 Dirty	FT9	FJ9
Primary # Zone 10 Dirty	FT10	FJ10
Primary # Earth Fault	ET38	ER38
Primary # Low Battery Fault	YT0	YR0
Primary # No Battery Fault	YT0	YR0
Primary # Telco Primary Line Fault	LT1	LR1
Primary # Telco Secondary Line Fault	LT2	LR2
Primary # NAC #1 Fault	ET32	ER32
Primary # NAC #2 Fault	ET33	ER33
Primary # NAC #3 Fault	ET34	ER34
Primary # NAC #4 Fault	ET35	ER35
Primary # NAC #1 Disable	ET101	ER101
Primary # NAC #2 Disable	ET102	ER102
Primary # NAC #3 Disable	ET103	ER103
Primary # NAC #4 Disable	ET104	ER104
Primary # Charger Fault	YP	YQ
Primary # Comm Trouble Primary #	YC1	YK1
Primary # Comm Trouble Secondary #	YC2	YK2
Primary # Printer Fault	VT	VR
Primary # ANN-Bus Fault	ET61	ER61
Primary # Option Card Fault	ET	ER
Primary # Memory Fault	YF	000
Future	000	000
Primary # System Off Normal	LB	LX
Primary # System Test Message	RP	000
Primary # System Abnormal Test Message	RP99	000
Primary # Power Supply Sync Fault	OU	OV

SIA-DCS Format - Secondary Central Station Phone Number

The information shown in Table 3.6 is automatically programmed for the Secondary Central Station phone number Event Codes when SIA-DCS Format is selected. To disable event reporting, select the desired Event Code to be disabled and press ***0*** or ***Clear*** and then ***Enter*** to disable it. (***Enter*** must be pressed to save the selection. Pressing ***Escape*** will not save the selection). *Note that disabling the Event Code for the Primary Central Station Phone Number Event Code will also disable that Event Code for the Secondary Central Station Phone.*

Table 3.6 Event Codes

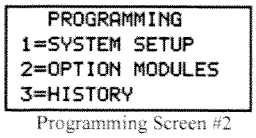
Event Description	Event Code Settings	
	Active	Restoral
Secondary # Zone 1 Alarm	FA1	FH1
Secondary # Zone 2 Alarm	FA2	FH2
Secondary # Zone 3 Alarm	FA3	FH3
Secondary # Zone 4 Alarm	FA4	FH4
Secondary # Zone 5 Alarm	FA5	FH5
Secondary # Zone 6 Alarm	FA6	FH6
Secondary # Zone 7 Alarm	FA7	FH7
Secondary # Zone 8 Alarm	FA8	FH8
Secondary # Zone 9 Alarm	FA9	FH9
Secondary # Zone 10 Alarm	FA10	FH10
Secondary # Zone 1 Disabled	FB1	FU1
Secondary # Zone 2 Disabled	FB2	FU2
Secondary # Zone 3 Disabled	FB3	FU3
Secondary # Zone 4 Disabled	FB4	FU4
Secondary # Zone 5 Disabled	FB5	FU5
Secondary # Zone 6 Disabled	FB6	FU6
Secondary # Zone 7 Disabled	FB7	FU7
Secondary # Zone 8 Disabled	FB8	FU8
Secondary # Zone 9 Disabled	FB9	FU9
Secondary # Zone 10 Disabled	FB10	FU10
Secondary # Drill	FI	FK
Secondary # AC Fault	AT	AR
Secondary # Zone 1 Fault	FT1	FJ1
Secondary # Zone 2 Fault	FT2	FJ2
Secondary # Zone 3 Fault	FT3	FJ3
Secondary # Zone 4 Fault	FT4	FJ4
Secondary # Zone 5 Fault	FT5	FJ5
Secondary # Zone 6 Fault	FT6	FJ6
Secondary # Zone 7 Fault	FT7	FJ7
Secondary # Zone 8 Fault	FT8	FJ8
Secondary # Zone 9 Fault	FT9	FJ9
Secondary # Zone 10 Fault	FT10	FJ10
Secondary # Zone 1 Dirty	FT1	FJ1

Table 3.6 Event Codes (Continued)

Secondary # Zone 2 Dirty	FT2	FJ2
Secondary # Zone 3 Dirty	FT3	FJ3
Secondary # Zone 4 Dirty	FT4	FJ4
Secondary # Zone 5 Dirty	FT5	FJ5
Secondary # Zone 6 Dirty	FT6	FJ6
Secondary # Zone 7 Dirty	FT7	FJ7
Secondary # Zone 8 Dirty	FT8	FJ8
Secondary # Zone 9 Dirty	FT9	FJ9
Secondary # Zone 10 Dirty	FT10	FJ10
Secondary # Earth Fault	ET38	ER38
Secondary # Low Battery Fault	YT0	YR0
Secondary # No Battery Fault	YT0	YR0
Secondary # Telco Primary Line Fault	LT1	LR1
Secondary # Telco Secondary Line Fault	LT2	LR2
Secondary # NAC #1 Fault	ET32	ER32
Secondary # NAC #2 Fault	ET33	ER33
Secondary # NAC #3 Fault	ET34	ER34
Secondary # NAC #4 Fault	ET35	ER35
Secondary # NAC #1 Disable	ET101	ER101
Secondary # NAC #2 Disable	ET102	ER102
Secondary # NAC #3 Disable	ET103	ER103
Secondary # NAC #4 Disable	ET104	ER104
Secondary # Charger Fault	YP	YQ
Secondary # Comm Trouble Primary #	YC1	YK1
Secondary # Comm Trouble Secondary #	YC2	YK2
Secondary # Printer Fault	VT	VR
Secondary # ANN-Bus Fault	ET61	ER61
Secondary # Option Card Fault	ET	ER
Secondary # Memory Fault	YF	000
Future	000	000
Secondary # System Off Normal	LB	LX
Secondary # System Test Message	RP	000
Secondary # System Abnormal Test Message	RP99	000
Secondary # Power Supply Sync Fault	OU	OV

3.5.6 History

The History option allows an authorized user to view or erase events which have occurred in the control panel. Pressing *3* while viewing Programming Screen #2 will display the History options as shown in the following display:



Programming Screen #2

History Screen

History Screen

3.5.6.1 View Events

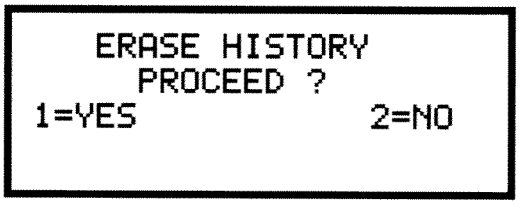
Pressing *1* while viewing the History Screen will allow the user to select the events to be viewed as illustrated in the following:

View Events Screen

While displaying the View Events screen, press *1* to view all events, *2* to view only alarms or *3* to view other events. Use the up and down arrow keys to scroll through all of the displayed events.

3.5.6.2 Erase History

The Erase History option allows a user to erase all events from the history file. This will provide a clean slate in order to use the history file to track future events. Pressing *2* while viewing the History Screen will display the following screen:



Erase History Screen

Pressing *1* while viewing the Erase History Screen will erase all events from the History file. During this process, the display will read as follows:

Erase History Wait Screen

After the History file has been erased, the display will return to the History Screen.

3.5.7 Walktest

Walktest allows an individual to test the fire alarm system without the necessity to reset the control panel after each device activation. Pressing *1* while viewing the Programming Screen #3 will cause the following Walktest options to be displayed:

```
    PROGRAMMING
1=WALKTEST
2=CLEAR PROGRAM
3=PASSWORD CHANGE
```

Programming Screen #3

```
      WALKTEST
1=SILENT
2=AUDIBLE
3=VIEW RESULT
```

Walktest Screen

To perform a silent walktest which will not sound the NACs, press *1* while viewing the Walktest Screen. To perform an audible walktest, which will sound the NACs, press *2* while viewing the Walktest Screen. When either option is chosen, the panel will enter Walktest Mode and the following screen will be displayed:

```
UNIT IN WALKTEST
```

Walktest Active Screen

The user can now perform a one-person walktest by activating devices throughout the system. As each device is activated, the screen will display the information about the activated device as shown below. Note that the **colon (:)** in the time is replaced with an **asterisk (*)** to distinguish the walktest screen from an actual alarm screen.

```
ALARM ZONE 1
     <ADJ> <NOUN>
                Z01
 10*00A 010805
```

After completion of the Walktest, press the *Esc* (Escape) key to exit Walktest Mode and return to the Walktest Screen. The results of the Walktest can now be viewed by pressing *3* while viewing the Walktest Screen. The following screen will be displayed:

```
WALKTEST RESULTS
```

Use the up and down arrow keys to view all of the walktest results which will be displayed as illustrated in the preceding screen. Note that the Walktest log is stored in RAM. If all power (AC and DC) is removed from the FACP, the Walktest log information will be lost. This information is also overwritten when subsequent walktests are performed.

3.5.8 Clear Program

Pressing *2* while viewing Programming Screen #3, will select the Clear Program option. The control panel will provide a warning to the user by prompting with the following display:

```
    WARNING!
 SYSTEM CHANGE
   PROCEED?
1=YES          2=NO
```

```
   PROGRAMMING
1=WALKTEST
2=CLEAR PROGRAM
3=PASSWORD CHANGE
```

Programming Screen #3

Pressing *1* will cause the control panel to carry out the selected clear option. Pressing *2* will prevent programming from being cleared.

3.5.9 Password Change

```
   PROGRAMMING
1=WALKTEST
2=CLEAR PROGRAM
3=PASSWORD CHANGE
```

Programming Screen #3

The factory set passwords, which have been programmed into the control panel, can be changed by selecting the Password Change option. Pressing *3* while viewing Programming Screen #3 will cause the following screen to be displayed:

```
  PASSWORD CHANGE
1=MASTER
2=MAINTENANCE
```

Password Change Screen

Press *1* to change the Master Programming Level password or *2* to change the Maintenance Level password. *Note that the passwords will <u>not</u> be displayed on annunciators.*

The following screen will appear when either change option is selected:

```
ENTER NEW FIVE DIGIT
      PASSWORD
```

Enter Password Screen

A flashing cursor will appear in the center of the display. Enter a new five digit password (such as 10101 for the Master Level). After the fifth digit is entered, the following screen will be displayed:

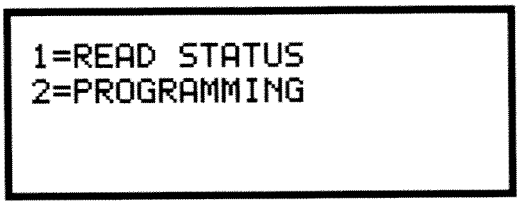
```
    VERIFY NEW
     PASSWORD
```

Password Change Screen

The new five digit password must be re-entered to accept the change. The display will then return to the initial Password Change Screen.

3.6 Maintenance Programming Level

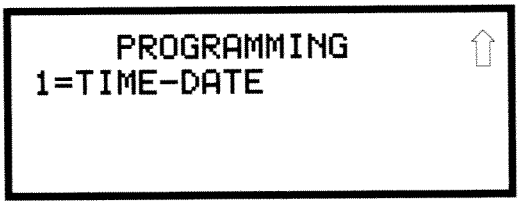
To access Maintenance Programming mode, press the *Enter* key. The LCD will display the following:



To enter the Maintenance Programming mode, press *2*. The display will read as follows:

When the ***Maintenance*** level password (default *11111*) is entered, the following screen will appear:

Note that in the preceding screens, an arrow appears to inform the programmer that additional options can be viewed by pressing the keypad *down* arrow key, as shown in the following screen.



3.6.1 Input Zones - Enable/Disable

The Zone Setup option allows the user to enable or disable desired zones. Pressing *1* for Zone Setup, while viewing Maintenance Screen #1 will cause the following screens to be displayed:

```
PROGRAMMING
1=INPUT ZONES
2=HISTORY
3=WALKTEST
```

Maintenance Screen #1

```
  POINT PROGRAM      ⇩
1=ZONE 1
2=ZONE 2
3=ZONE 3
```

Zone Select Screen

Pressing the down arrow key will display additional Zones (Zones 4 - 5 for GF505 and Zones 4 - 10 for GF510). Select the number corresponding to the desired zone. A screen will appear which will allow enabling or disabling of the selected zone, as illustrated in the following example:

```
        ZONE 1
1=ENABLED          YES
```

Enable/Disable Select Screen

Pressing *1* repeatedly will cause the display to toggle between *Enabled Yes* and *Enabled No*.

3.6.2 History

Pressing *2* while viewing Maintenance Screen #1 will cause the following screen to be displayed:

```
       HISTORY
1=VIEW EVENTS
2=ERASE HISTORY
```

History Screen

The History feature allows the operator to view control panel events which have been stored in a history file in memory and erase the contents of the history file

Pressing *1* while viewing the History screen will cause the following screen to be displayed:

```
      HISTORY
1=VIEW ALL
2=VIEW ALARMS
3=VIEW OTHER EVENTS
```

To view all the events which have occurred in the control panel since the history file was last erased, press *1* while viewing the Events screen. To view only alarms which have occurred, press *2* while viewing the Events screen. To view events other than alarms, press *3*. The most recent event will be displayed on the screen. To view all of the selected events, press the up or down arrow keys to scroll through the list of events. If no events have occurred, the display will read *NO EVENTS IN HISTORY.*

Pressing 2 while viewing the History Screen will cause the following screen to be displayed:

```
   ERASE HISTORY
     PROCEED ?
1=YES          2=NO
```

Erase History Screen

Pressing *1* while viewing the Erase History Screen will cause the message *ERASING HISTORY, PLEASE WAIT* to be displayed. The display will then return to the History Screen. Pressing *2* will cause the display to return to the History Screen without erasing the History file.

3.6.3 Walktest

```
   PROGRAMMING
1=INPUT ZONES
2=HISTORY
3=WALKTEST
```

Maintenance Screen #1

To perform a walktest, press *3* while viewing Maintenance Screen #1. The following screen will be displayed:

```
      WALKTEST
1=SILENT
2=AUDIBLE
3=VIEW RESULT
```

Walktest Screen

The operator can press *1* to perform a silent walktest or *2* to perform an audible walktest. The display will read *UNIT IN WALKTEST.* To end the Walktest, press the Esc (Escape) key.

Pressing *3* after the walktest has been completed, will allow the operator to view the results of the walktest.

3.6.4 Time-Date

To program the time and date into the control panel, press *1* while viewing Maintenance Screen #2. The following display will appear:

```
PROGRAMMING
1=TIME-DATE
```

Maintenance Screen #2

```
   TIME AND DATE
1=TIME        01:00 AM
2=DATE     01-01-2001
3=CLOCK FORMAT   12HRS
```

Time and Date Screen

To change the time, press *1* to display the following screen:

```
ENTER TIME AS 12HRS
        :
     01:00 AM
1=AM            2=PM
```

Time Screen

A flashing cursor will appear on the left side of the display. Enter the four digit number corresponding to the time (0000 - 1259). When the fourth digit is entered, the cursor will move one position to the right. Press *1* for AM or *2* for PM to complete entering the time. The display will return to the Time and Date Screen displaying the new time.

To change the date, press *2* while viewing the Time and Date Screen. The following screen will be displayed:

```
   ENTER DATE
  **-**-****
MONTH DAY YEAR
  01-01-2001
```

Date Screen

A flashing cursor will appear on the left side of the display. Enter the two digit month, two digit day and four digit year. The cursor will move one position to the right after each entry. When the fourth digit of the year has been entered, the display will return to the Time and Date Screen which will show the new date.

To change between 12 hour and 24 hour format, press *3* while viewing the Time and Date screen. Each press of the *3* key will toggle the display between 12 HR and 24 HR format.

SECTION 4 Operating Instructions

4.1 Panel Control Buttons

4.1.1 Acknowledge/Step

The first press of the *Acknowledge/Step* key silences the piezo sounder, changes flashing LEDs to steady and also changes the status field on the LCD display from capital letters to small letters (*TROUBL* to *troubl*). When the piezo is silenced, an *acknowledge* message is sent to the printer and the history file. *Acknowledge* also sends a *silence piezo* command to the optional annunciators connected to the FACP. The Acknowledge key will have no effect on the Notification Appliance Circuits.

When more than one event exists, the first press of the Acknowledge/Step key functions as described in the preceding paragraph. Subsequent pressing of the key *steps* through each active event.

4.1.2 Alarm Silenced

The *Alarm Silenced* key performs the same functions as Acknowledge/Step except it will not step through each event when multiple events are present at the panel. If an alarm exists, the Alarm Silenced key turns off all silenceable NACs (Notification Appliance Circuits) and causes the Alarm Silenced LED to turn on. It also sends an 'alarm silenced' message to the printer, history file and optional annunciators. A subsequent new alarm will resound the system NACs. The Alarm Silenced LED is turned off by pressing the Reset key, the Drill key or subsequent activation of the NACs.
Note that if Silence Inhibit has been enabled, NACs cannot be silenced for one minute following initiation of an alarm.

4.1.3 Drill/Hold 2 Sec

When the *Drill* key is held for a minimum of two seconds (time required to prevent accidental activations), the FACP turns on all NAC outputs and turns off the Alarm Silenced LED if it was previously on. The *EVAC IN SYSTEM* message is shown on the LCD display. The same message is sent to the printer and history file. The *Alarm Silence* key can be used to turn off all silenceable NAC outputs following activation by the *Drill* key.

4.1.4 Reset

Pressing and releasing the *Reset* key turns off all NACs, temporarily turns off resettable power to 4-wire detectors, causes a *RESET IN SYSTEM* message to be displayed on the LCD and sends the same message to the printer and history file. It also performs a lamp test by turning on all LEDs, piezo sounder and LCD display segments after the *Reset* key is released. Any alarm or trouble that exists after a reset will resound the system.
Note that if Silence Inhibit has been enabled, the FACP cannot be reset for one minute following initiation of an alarm.

4.2 LED Indicators

The five LED indicators, which are located on the front panel, operate as follows:

AC Power

This is a green LED which illuminates if AC power is applied to the FACP. A loss of AC power will turn off this LED

Fire Alarm

This red LED flashes when one or more alarms occur. It illuminates steady when the *Acknowledge/ Step* or *Alarm Silence* key is pressed. The Fire Alarm LED turns off when the *Reset* key is pressed. The LED will remain off if all alarms have been cleared.

Supervisory

This is a yellow LED that flashes when one or more supervisory conditions occur, such as a sprinkler valve tamper condition. It illuminates steady when the *Acknowledge/Step* or *Alarm Silence* key is pressed. It turns off when the *Reset* key is pressed and remains off if all supervisory alarms have been cleared.

Trouble

This is a yellow LED that flashes when one or more trouble conditions occur. It stays on steady when the *Acknowledge/Step* or *Alarm Silence* key is pressed. The LED turns off when all trouble conditions are cleared. This LED will also illuminate if the microprocessor watchdog circuit is activated.

Alarm Silenced

This is a yellow LED that turns on after the *Alarm Silence* key is pressed while an alarm condition exists. It turns off when the *Drill* or *Reset* key is pressed.

4.3 Normal Operation

With no alarms or troubles in the system, the display message is *System All Normal* along with the current time and date as shown below. To set the time and date, refer to the appropriate section in this manual.

The FACP performs the following functions at regular intervals in Normal mode:

- ✓ Monitors AC input voltage and battery voltage
- ✓ Monitors and reports status option cards and control panel
- ✓ Refreshes LCD display and updates time
- ✓ Scans control panel keypad for key presses
- ✓ Tests memory
- ✓ Updates and reads all communications busses (EIA-485, etc.)
- ✓ I3 smoke detectors will be polled for maintenance and freeze conditions on initial entry into Normal mode. Thereafter, each device will be polled every hour for freeze and every four hours for maintenance conditions

Note: To ensure that the system is functioning properly, the FACP will perform a freeze check five minutes after the panel is reset, followed by a maintenance check. If there is no freeze or maintenance condition, the panel will continue to monitor for freeze conditions every hour and maintenance conditions every four hours.

4.4 Trouble Operation

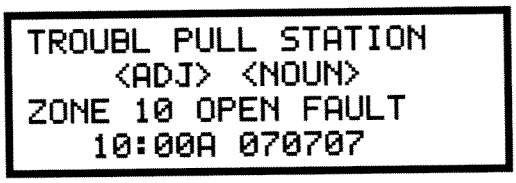
With no alarms in the system, the detection of a trouble will cause the following:

- The piezo to pulse 1 second On and 1 second Off
- The system Trouble LED to flash one second On and one second Off
- The trouble relay to activate
- *TROUBL* with device type, noun/adjective, address and trouble description will appear on the LCD display
- The same message, along with the time and date, is sent to the optional printer and the history buffer.
- Communicate the trouble conditions to the Central Station

Note that specific troubles will initiate additional actions; for example, loss of AC power will turn off the AC Power LED, etc.

Input Zone

For Input Zones, the following is a typical message that could appear on the LCD display for a device trouble:



The information displayed in the above example provides the following information:

- First line in display:
  - ✓ The type of event; in this example *OPEN* indicating a circuit trouble
  - ✓ Device type identifier; in this example, *PULL STATION* indicates a manual device. Other device type identifiers which can be displayed include *SMOKE* for Smoke Detector, *HEAT* for Heat Detector, etc.
- Second line in display:
  - ✓ <ADJ>; refers to the user programmed adjective descriptor from library list resident in the control panel or custom entry via PC.
  - ✓ <NOUN>; refers to the user programmed noun descriptor from library list resident in the control panel or custom entry via PC.
- Third line in display indicates Zone and the fault condition. Other possible troubles include:
  - ❒ *OPEN* - indicating an open circuit
  - ❒ *DIRTY* - maintenance alert indicating that a detector is near but below the allowed alarm limit and is in need of maintenance before the performance is compromised
- Fourth line in display:
  - ✓ Time; the current time in this example is *10:00A* which represents 10:00 AM
  - ✓ Date; the current month, day and year in this example is *09* for September, *08* for the 8th day of the month and *07* for the year 2007

Pressing the *Acknowledge/Step* or *Alarm Silence* key will cause the pulsing piezo to silence and the system Trouble LED to change from flashing to on steady. This block acknowledgment occurs regardless of the number of troubles, alarms and supervisory events active in the system. When the *Acknowledge/Step* key is pressed and at least one new alarm or trouble exists in the system, the 'acknowledge' message is sent to the printer and history file. If the trouble clears, either before or after the *Acknowledge/Step* key is pressed, the 'clear trouble' message is sent to the printer and history file.

If all troubles clear and there are no supervisory or fire conditions active in the system, the system returns to normal mode operation and the *System All Normal* message is shown on the LCD display and sent to the history and printer files. The auto-restore feature will restore cleared troubles even if the troubles were never acknowledged. Note that pressing the *Alarm Silence* key when only troubles exist in the system will have the same effect as pressing the *Acknowledge/Step* key except the Alarm Silenced LED will light.

4.5 Alarm Operation

Alarm operation is similar to trouble operation with the following differences:

- The piezo sounder produces a steady output as opposed to a pulsed output
- The Fire Alarm LED flashes 1 second On and 1 second Off
- The LCD displays *Alarm* along with the device name, type, adjective/noun, associated zones and time/date
- Communicate the alarm to the Central Station
- Alarms latch and *are not allowed to clear automatically*
- Timers for Silence Inhibit, Autosilence and Trouble Reminder are started
- Alarms activate the alarm relay
- Silenced alarms are resounded
- The trouble relay is not activated
- Store event in history buffer

A typical alarm display would be as illustrated below:

Note that the device type, which in this example is *PULL STATION*, can be any other programmable alarm type.

The information displayed in the above example provides the following information:

- First line in display:
  - ✓ The type of event; in this example *ALARM* indicating an alarm condition
  - ✓ Device type identifier; in this example, *PULL STATION* indicates a manual pull box. Other device type identifiers which can be displayed include *SMOKE* for Smoke Detector, *HEAT* for Heat Detector, etc.
- Second line in display:
  - ✓ <ADJ>; refers to the user programmed adjective descriptor from library list resident in the control panel or custom entry via PC.
  - ✓ <NOUN>; refers to the user programmed noun descriptor from library list resident in the control panel or custom entry via PC.
- Third line in display: *Zone 10* indicates the zone programmed to this device which, in this example, is Input Zone 10.

- Fourth line in display:
  - ✓ Time; the current time in this example is *10:00A* which represents 10:00 AM
  - ✓ Date; the current month, day and year in this example is *09* for September, *08* for the 8th day of the month and *07* for the year 2007

4.6 Supervisory Operation

Supervisory operation is similar to alarm operation but with the following differences:

- The piezo sounder pulses ½ second On and ½ second Off
- The Supervisory LED flashes ½ second On and ½ second Off
- The LCD displays the status label *Active Supervisory* along with the device name, type, adjective/noun, associated zones and time/date
- Communicate the supervisory condition to the Central Station
- The supervisory relay is activated
- The alarm relay is not activated
- Silenced alarms are not resounded
- Timers are not started
- Store event in history buffer

A typical Supervisory event would be displayed as illustrated in the following:

In the preceding example:

- ❒ *FROZEN SUPRV* - indicates zone detector is below approximately 45°F

Note that, like alarms, supervisory signals latch, except when programmed for supervisory autoresettable. Supervisory alarms do not cause resound as do other alarm conditions. Open circuits in supervisory wiring are processed by the control panel the same way as other trouble conditions. Refer to "Alarm Operation" on page 105, for a description of the information displayed on the control panel LCD.

4.7 Process Monitor Operation

Process Monitor operation will initiate the following events:

- The piezo sounder pulses ¼ second On and ¼ second Off
- The LCD displays a process monitor message along with the device name, type, adjective/noun, associated zones and time/date
- Communicate the process monitor condition to the Central Station
- Relays programmed for process monitoring will be activated
- The alarm relay is not activated
- Silenced alarms are not resounded
- Timers are not started
- Store event in history buffer

Note that, like supervisories, process monitor signals latch, except when programmed for process monitor autoresettable.

4.8 Hazard/Tornado Condition Operation

Hazard/Tornado Condition operation will initiate the following events:

- The piezo sounder pulses ½ second On, ½ second Off
- The LCD displays a hazard message along with the device name, type, adjective/noun, associated zones and time/date
- Communicate the hazard condition to the Central Station
- Relays programmed for hazard will be activated
- The alarm relay is not activated
- Silenced alarms are not resounded
- Timers are not started
- Store event in history buffer
- Supervisory LED flashes ½ second On, ½ second Off

Hazard conditions latch.

4.9 Medical Alert Condition Operation

Medical Alert Condition operation will initiate the following events:

- The piezo sounder ½ second On, ½ second Off
- The LCD displays a medical alert message along with the device name, type, adjective/noun, associated zones and time/date
- Communicate the medical alert condition to the Central Station
- Relays programmed for medical alert will be activated
- The alarm relay is not activated
- Silenced alarms are not resounded
- Timers are not started
- Store event in history buffer
- Supervisory LED flashes ½ second On, ½ second Off

Medical alert conditions latch.

4.10 Disable/Enable Operation

Input zones which are disabled do not cause an alarm or any zone activation. Disabled NACs are held in the off state. All disabled zones/NACs are treated as if they were in trouble, with the exception being the status label that will be displayed is *DISABL*.

4.11 Waterflow Circuits Operation

If an alarm exists from a zone that is a waterflow non-silenceable type, the Alarm Silence key will not function.

4.12 Detector Functions

Maintenance Alert

I³ smoke detectors will be polled for maintenance and freeze conditions on initial entry into Normal mode. Thereafter, each device will be polled every hour for freeze and every four hours for maintenance conditions All alarm and system trouble conditions are annunciated on the control panel's LCD.

Note: To ensure that the system is functioning properly, the FACP will perform a freeze check five minutes after the panel is reset, followed by a maintenance check. If there is no freeze or maintenance condition, the panel will continue to monitor for freeze conditions every hour and maintenance conditions every four hours.

Important! *In order to avoid false alarms, input zones must be disabled prior to any service work being done. After service is completed, the input zones must be re-enabled.*

I³ Smoke Detector Replacement

If an I³ smoke detector is to be replaced, the associated zone must be disabled prior to detector replacement to prevent any unwanted alarms. The input zone must be reenabled after maintenance has been completed. Refer to *Enable/Disable Zone* in the section titled *Input Zones* which begins on page 56.

System Alarm Verification

The control panel may be programmed to perform alarm verification to help eliminate the nuisance of false alarms. Alarm verification applies to smoke detectors only.

4.13 Time Functions: Real-Time Clock

The FACP includes a crystal-based clock that provides time of day, date and day of week. Time is displayed as 12 or 24 hour time with month/day/year and is stored in RAM. Daylight savings time change-over is programmable and automatic. If both AC and battery are lost, the time must be reprogrammed.

4.14 Coded Operation

The NAC circuits resident on the control panel main circuit board can be programmed for coded operation. The available pulse rates which can be programmed for coded operation are as follows:

- Continuous: Steady output with no pulsing
- March Time: Pulses at 120 ppm (pulses per minute)
- Temporal Code: Pulses at ½ second On, ½ second Off, ½ second On, ½ second Off, ½ second On, 1½ second Off
- California Code: 10 seconds On, 5 seconds Off
- Two-Stage Pulses at 20 ppm (pulses per minute) for 3 or 5 minutes and then changes to Temporal

4.15 Presignal

Presignal option programs an initiating device to delay the activation of NACs while allowing visual verification by a person. Once a detector triggers an alarm, the onboard piezo sounds immediately, but the NACs are not activated for a user programmed time duration of up to three minutes. Note that the alarm relay and communicator will respond to the initial alarm immediately.

After the programmed delay, the NACs will activate if the source of the alarm is not cleared. Note that if a second alarm occurs during the programmed time delay, the alarm will be processed immediately, causing activation of the NACs. The events which occur upon Presignal activation are as follows:

- ✓ onboard piezo sounds immediately
- ✓ control panel LCD display will indicate a presignal event and the active zone
- ✓ annunciators (if enabled) will sound the local piezo, and pulse the alarm LED and zone LED
- ✓ outputs (NACs) of associated zones will be inhibited from activating for a user programmed time delay of up to three minutes
- ✓ second alarm occurring anytime during the time delay will cause immediate activation of all associated outputs

Presignal operation requires the approval of the local Authority Having Jurisdiction.

4.16 Positive Alarm Sequence

PAS (Positive Alarm Sequence) option will program a smoke detector to delay panel activation (including alarm relay and communicator) for a period of 15 seconds.

When a detector triggers an alarm, the onboard piezo sounds immediately, but the NACs are prevented from activating for 15 seconds. This inhibit time is factory set and cannot be changed. Pressing the Alarm Silence or Acknowledge/Step key during the 15 second inhibit time will silence the piezo sounder and start a timer which prevents activation of NACs for an additional time duration which can be user programmed for up to three minutes. After the programmed delay, the NACs will activate if the source of the alarm is not cleared. Note that if a second alarm occurs during either time delay, the alarm will be processed immediately, causing activation of the NACs. The events which occur upon PAS activation are as follows:

- ✓ onboard piezo sounds immediately
- ✓ control panel LCD display will indicate a PAS event and the active zone
- ✓ annunciators (if enabled) will sound the local piezo, and pulse the alarm LED and zone LED
- ✓ outputs (NACs) of associated zones will be inhibited from activating for a factory set duration of 15 seconds
- ✓ pressing the Alarm Silence or Acknowledge/Step key will start a timer which inhibits output activation for additional time delay of up to three minutes which is user programmable
- ✓ second alarm occurring anytime during either time delay will cause immediate activation of all associated outputs

PAS operation requires the approval of the local Authority Having Jurisdiction.

4.17 Special System Timers

4.17.1 Silence Inhibit Timer

This option, if selected, prevents the *Alarm Silence* key from functioning for 60 seconds following an alarm. A new alarm during the initial 60 second period will not cause the timer to restart with a new 60 seconds. *Silence Inhibit operation requires the approval of the local Authority Having Jurisdiction.*

4.17.2 Autosilence Timer

If Autosilence is selected, the notification appliances, programmed as silenceable, will automatically be silenced after a programmable duration of from 5 to 30 minutes. Pressing the *Drill* key will restart the timer. *Autosilence operation requires the approval of the local Authority Having Jurisdiction.*

4.17.3 Trouble Reminder

If selected, this feature causes a reminding 'beep' every 15 seconds during an alarm (after the *Alarm Silence* key is pressed) and every two minutes during a trouble condition (after the *Acknowledge/Step* or *Alarm Silence* key is pressed). The 'beeps' from the onboard piezo sounder will occur until the alarm or fault is cleared.

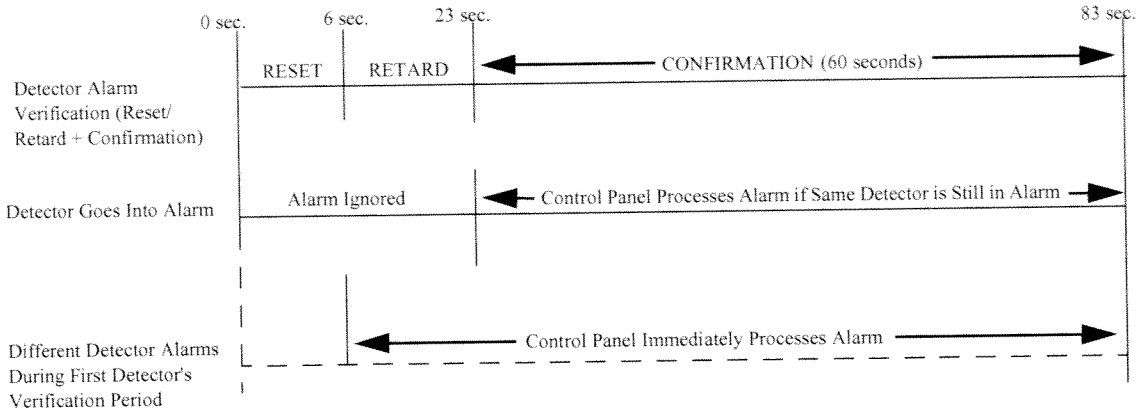
Note that if Trouble Reminder feature is not selected and the trouble is not cleared within 24 hours, the piezo will resound, indicating that the trouble condition still exists.

4.17.4 Waterflow Retard Timer

If selected, this option will delay the activation of a waterflow type alarm for a programmable time duration from 1 to 90 seconds. This delay is in addition to any time delay inherent in the waterflow device. *This feature requires the approval of the local Authority Having Jurisdiction.*

4.17.5 Alarm Verification (None or One Minute)

If alarm verification is selected, a smoke detector activation will cause the FACP to reset the detector by removing power for 6 seconds. Power is reapplied and a 17 second retard period begins which allows all detectors to stabilize. If no other detectors alarm, there will be no alarm indication at the FACP during the 23 second Reset/Retard period. A Confirmation period of 60 seconds follows, during which a subsequent alarm from the same detector will cause the panel to immediately activate the appropriate outputs and indicate the alarm condition at the FACP. If a different detector zone alarms any time during the first detector's Retard & Confirmation period, the panel will immediately activate all appropriate outputs and indicate the alarm condition at the FACP. If no additional detector alarms occur within 83 seconds of the first alarm (23 second Reset/ Retard plus 60 second Confirmation), the timer resets and the panel is ready to verify any new detector alarms which may occur.



Note: Alarm Verification is available only for smoke detectors.

4.18 Walktest

Walktest is a feature which allows one person to test the fire alarm system. An audible walktest will momentarily sound the Notification Appliance Circuits in the building and store the walktest information in a file at the panel. A silent walktest will not sound the NACs but will store the walktest information in a file which can be viewed at the panel. Disabled NAC devices will not activate during walktest. In addition, I^3 smoke detectors will enter their own test mode causing their LEDs to flash twice every five seconds (refer to I^3 specification document).

Alarm/Shorted Condition

When in audible Walktest, the panel responds to each new alarm and activates its programmed control outputs for four seconds, if those outputs have been programmed for silenceable activation. It also stores each alarm in the walktest history file which can be sent to an optional printer. The stored display will be the same as if the device actually activated except the colon (:) in the time stamp is replaced with an asterisk (*).

Open Condition

Addressable devices as well as all main circuit board NACs are monitored for fault conditions during Walktest mode. When a new trouble condition occurs, the FACP will activate all NACs programmed for Walktest, then shut them off after eight seconds.

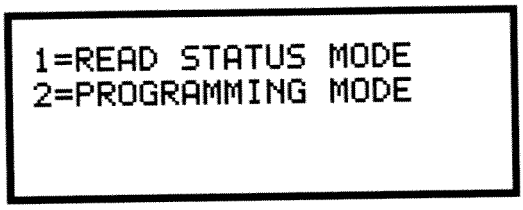
While in Walktest, the trouble relay is activated and the system Trouble LED flashes (as in all of the Program and status change operations). The alarm relay is not activated.

4.19 Read Status

Read Status functions do not require a password. The control panel will continue to provide fire protection while in Read Status mode. This mode can be entered while the control panel is in alarm or trouble. If a new alarm or trouble occurs during these functions, the Read Status is exited to prevent confusion.

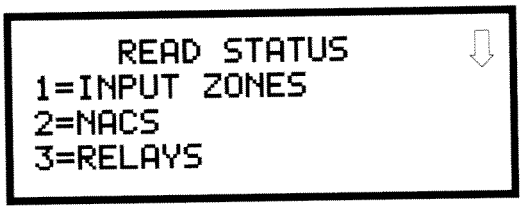
Read Status Entry

When the operator presses the control panel *Enter* key, the LCD will display the following:

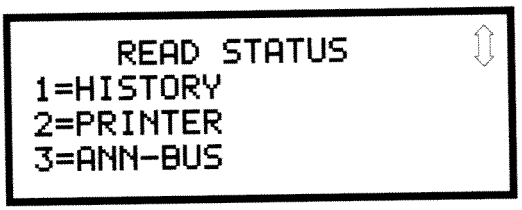


Pressing *1*, while this screen is being displayed, will cause the control panel to enter the Read Status mode which allows the user to view and print the programmed features and status of the control panel.

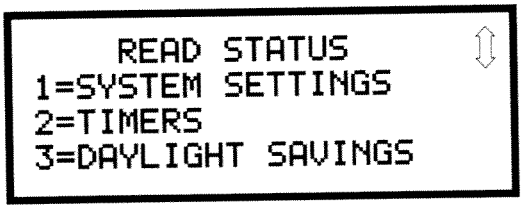
The following screens will be displayed:



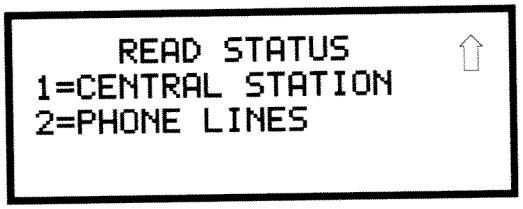
Read Status Screen #1



Read Status Screen #3



Read Status Screen #2



Read Status Screen #4

4.19.1 Input Zones

Pressing *1* while viewing Read Status Screen #1 will cause the following screens to be displayed:

```
     ZONE STATUS      ⇩
1=ZONE 1
2=ZONE 2
3=ZONE 3
```

```
    READ STATUS
1=INPUT ZONES
2=NACS
3=RELAYS
```

Read Status Screen #1

Pressing the down arrow key will allow the selection of Zones 4-5 for the GF505 and Zones 4-10 for the GF510.

The operator selects the zone which is to be viewed by pressing the number corresponding to the desired zone in each screen. For example, if *1* is pressed, the display will change to a screen similar to the following:

```
Normal PULL STATION

ZONE 1
 PRESS ⇩TO VIEW
```

Pressing the down arrow key, while viewing the screen shown above, will allow the operator to view additional programming information about the selected device, such as:

- Enable/Disable Status
- Device Type
- Alarm Verification On/Off (for detectors)
- PAS (Positive Alarm Sequence) Yes/No (for detectors only)
- Pre-Signal Yes/No (for detectors only)
- Adjective/Noun descriptor
- Silenceable Yes/No

4.19.2 NAC

Pressing *2* while viewing Read Status Screen #1 will display the following screen:

```
     NAC STATUS
1=NAC 1      3=NAC 3
2=NAC 2      4=NAC 4
```

The operator can press *1* to view the programmed options for NAC 1, *2* to view the programmed options for NAC 2, *3* to view the programmed options for NAC 3 or *4* to view the programmed options for NAC 4.

The resulting screens will display the following information:

- Enable/Disable Status
- Coding Selection (Temporal, Steady, etc.)
- Silenceable/Nonsilenceable
- Auto Silence Enable/Disable and time delay (in minutes)
- Silence Inhibit Enabled/Disabled

4.19.3 Relays

```
READ STATUS
1=INPUT ZONES
2=NACS
3=RELAYS
```

Read Status Screen #1

Pressing *3* while viewing Read Status Screen #1 will display the following screen:

```
RELAY
1=RELAY 1   ALARM
2=RELAY 2   TROUBLE
3=RELAY 3   SUPERV
```

This screen allows the operator to view the programmed option for each relay.

4.19.4 System Settings

Pressing *1* while viewing Read Status Screen #2 will display the following screens:

```
READ STATUS
1=SYSTEM SETTINGS
2=TIMERS
3=DAYLIGHT SAVINGS
```

Read Status Screen #2

```
SYSTEM SETTINGS  ⇩
TROUBLE REMIND    NO
FUTURE USE
CHRGR DISABLE     NO
```

```
SYSTEM SETTINGS  ⇧
USER BANNER:
XXX XXXXX XXXX XXXX
```

The operator can view the system settings options that have been programmed into the FACP.

4.19.5 Timers

Pressing *2* while Read Status Screen #2 will display the following screen:

```
    READ STATUS
1=SYSTEM SETTINGS
2=TIMERS
3=DAYLIGHT SAVINGS
```

Read Status Screen #2

```
        TIMERS
PAS DELAY          120
PRE SIGNAL         120
WATERFLW DELAY       0
```

```
        TIMERS
AC LOSS DELAY      2
```

These screens allow the operator to view the various timer settings.

4.19.6 Daylight Savings

Pressing *3* while Read Status Screen #2 will cause the following screens to be displayed:

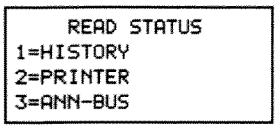
```
   DAYLIGHT SAVINGS
ENABLED            NO
START MONTH       MAR
START WEEK       WK 3
```

```
   DAYLIGHT SAVINGS
END MONTH         NOV
END WEEK         WK 3
```

These screens allow the operator to view settings that have been programmed for Daylight Savings Time.

4.19.7 History

Pressing *1* while viewing Read Status Screen #3 will display the following screens:



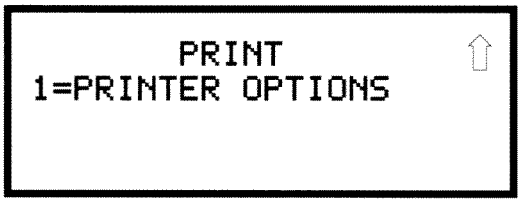
Read Status Screen #3

The operator can view all events which have been stored in the history file, only alarms or other events, such as troubles or supervisories, by pressing the corresponding number key.

4.19.8 Print

To print program data or control panel status, press *2* while viewing Read Status Screen #3. The following screens will be displayed:

Print Screen #1



Print Screen #2

Pressing *1* while viewing Print Screen #1 allows the user to print the History file which will detail all of the system activities since the file was last cleared from memory.

Pressing *2* while viewing Print Screen #1 allows the user to print the Walktest log which will detail all of the system activations during walktest since the log was last cleared. Refer to "Walktest" on page 96 for additional information on the display.

Pressing *3* while viewing Print Screen #1 will exit the Print operation.

Pressing *1* while viewing Print Screen #2 allows the user to view the printer settings.

4.19.9 ANN-BUS

Pressing *3* while viewing Read Status Screen #3 will display the settings for the ANN-BUS options as shown in the following screens:

```
    READ STATUS
1=HISTORY
2=PRINTER
3=ANN-BUS
```

Read Status Screen #3

```
    ANN-BUS                    ⇩
BUS ENABLED              NO
1=BUS MODULES
```

ANN-BUS Screen #1

```
    ANN-BUS                    ⇧
1=ANN-I/O OPTIONS
2=ANN-80 OPTION
```

ANN-BUS Screen #2

ANN-BUS Screen #1 indicates whether the ANN-BUS is enabled (Yes/No).

Pressing *1* while viewing ANN-BUS Screen #1 will display BUS Module addresses 1-8 and the devices, if any, located at those addresses.

Pressing *1* while viewing ANN-BUS Screen #2 will display the programmed options for the GFANN-I/O Module devices connected to the ANN-BUS.

Pressing *2* while viewing ANN-BUS Screen #2 will display the programmed options for the GFANN-80 devices connected to the ANN-BUS.

4.19.10 Central Station

Pressing *2* while viewing Read Status Screen #4 will display the following screens:

```
    READ STATUS
1=CENTRAL STATION
2=FUTURE USE
3=PHONE LINE
```

Read Status Screen #4

```
  CENTRAL STATION
REPORTING        YES
REPORT STYLE
       BOTH
```

Central Station Screen #1

```
  CENTRAL STATION
1=PRIMARY
2=SECONDARY
```

Central Station Screen #2

Central Station Screen #1 indicates whether the Central Station Reporting is enabled or disabled, if the Reports will be sent to one or both the Primary and Secondary Central Station phone numbers and the Call Limit for DACT trouble calls within a 24 hour period. Central Station Screen #2 provides information on the Primary and Secondary Central Station programming which includes:

- Test Time Interval
- Account Code
- 24 Hour Test Time
- Phone Number
- Communication Format
- Event Codes

4.19.11 Phone Line

Pressing *1* while viewing Read Status Screen #4 will display the following screen:

```
      PHONE LINE
PRIMARY        TCH TNE
SECONDARY      TCH TNE
```

This screen indicates the both the Primary and Secondary phone lines have been configured for touchtone dialing operation.

SECTION 5 Central Station Communications

The control panel transmits zone and system status reports to Central Stations via the public switched telephone network. Two supervised telephone line connections are made to interface the control panel to the telephone lines. Two optional 7 foot telephone cords are available for this purpose and can be purchased separately.

The control panel supervises both telephone lines for proper voltage. A delay of two minutes will occur before a fault in either phone line connection is reported as a trouble. When a fault is detected, an audible trouble signal will sound, the LCD display will indicate the phone line trouble and the trouble condition will be reported to the Central Station over the remaining operational phone line.

The control panel comes with line seizure capability provided for both the primary and secondary telephone line interfaces. Any time that the control panel needs to make a call to a Central Station, line seizure will disconnect any local premises phones sharing the same telephone line.

All transmissions to the Central Stations will be sent over the primary phone line. In the event of noisy phone lines, transmissions will be sent over the backup secondary phone line.

Two phone numbers must be programmed, the primary Central Station phone number and the secondary Central Station phone number. All system reports will be transmitted to the primary Central Station phone number. Reports will automatically be sent to the secondary Central Station phone number if attempts to transmits to the primary Central Station phone number are unsuccessful. If 10 total attempts to communicate are unsuccessful, a Communicator Failure report will be displayed. Note that as an option, *all* reports may also be sent to the secondary Central Station phone number.

The FACP meets NFPA 72 National Fire Code reporting requirements for: (a) the type of signal, (b) condition and (c) location of the reporting premises. The general priority reporting structure is:

1. Zone Alarms and Restores
2. Zone Troubles and Restores
3. System Troubles and Restores
4. 24-hour Test

5.1 Transmittal Priorities

The integral communicator transmits highest priority events first. Events, in terms of priority, are listed below in descending order:

1. Alarms (highest priority level)
   - ✓ Pull stations
   - ✓ Waterflow
   - ✓ Smoke detector
   - ✓ Other alarm types
2. Supervisory Zone
3. System Troubles
   - ✓ Zone disabled
   - ✓ Fire drill
   - ✓ AC fail (after delay)
   - ✓ Zonal faults
   - ✓ Earth fault
   - ✓ Low battery
   - ✓ Telephone line fault
   - ✓ Notification Appliance Circuits fault
   - ✓ Communication trouble
   - ✓ Annunciator trouble
   - ✓ System off normal
4. Restoral Reports
   - ✓ Zone alarm
   - ✓ Supervisory
   - ✓ Zone(s) enabled
   - ✓ Fire drill
   - ✓ AC
   - ✓ Zone fault
   - ✓ Earth
   - ✓ Battery
   - ✓ Telephone line
   - ✓ Notification Appliance Circuits
   - ✓ Communication
   - ✓ Annunciator trouble
   - ✓ System off normal
5. 24 Hour Test (lowest priority)

The table below shows UL listed receivers which are compatible with the GF505/GF510.

Table 5.1 Compatible UL Listed Receivers

	Format	Ademco 685 (1)	Silent Knight 9800 (2)	Osborne Hoffman 2000E (3)	Radionics 6600 (4)	SurGard MLR2 (5)	SurGard System III (6)	FBI CP220FB (7)
0	SIA-DCS-8		✔	✔	✔		✔	✔
1	SIA-DCS-20		✔	✔	✔		✔	✔
2	Ademco Contact ID	✔	✔	✔	✔	✔	✔	✔

1. With 685-8 Line Card with Rev. 4.4d software
2. With 124077V2.00 or later Receiver and 126047 Line Card Rev. M or later
3. With V.7301 Receiver S/W or later
4. With 01.01.03 Receiver S/W or later and Line Card 01.01.03 or later
5. With software V1.86
6. With software V1.6
7. With software V3.9

IMPORTANT! *It is the installer's responsibility to ensure that the Digital Alarm Communicator/ Transmitter is compatible with the Central Station Receiver, utilized by the monitoring service, prior to installation. The Compatibility Table provides a list of compatible receivers and associated software versions for the receivers. Changes in the hardware and/or software by the receiver manufacturers may affect the receiver compatibility with the FACP DACT. After completing the installation, communication between the DACT and Central Station Receiver must be tested and verified.*

SECTION 6 Power Supply Calculations

6.1 Overview

This section contains instructions and tables for calculating power supply currents in alarm and standby conditions. This is a four-step process, consisting of the following:

1. Calculating the total amount of AC branch circuit current required to operate the system
2. Calculating the power supply load current for non-fire and fire alarm conditions and calculating the secondary (battery) load
3. Calculating the size of batteries required to support the system if an AC power loss occurs
4. Selecting the proper batteries for your system

6.2 Calculating the AC Branch Circuit

The control panel requires connection to a separate, dedicated AC branch circuit, which must be labeled **FIRE ALARM**. This branch circuit must connect to the line side of the main power feed of the protected premises. No other non-fire alarm equipment may be powered from the fire alarm branch circuit. The branch circuit wire must run continuously, without any disconnect devices, from the power source to the control panel. Overcurrent protection for this circuit must comply with Article 760 of the National Electrical Codes as well as local codes. Use 14 AWG (2.00 mm^2) wire with 600 volt insulation for this branch circuit.

Use Table 6-1 , to determine the total amount of current, in AC amperes (A), that must be supplied to the system.

TABLE 6-1:120 VAC Branch Circuit Requirements

Device Type	Number of Devices		Current Draw (AC amps)		Total Current per Device
GF505 or GF510	1	X	3.90	=	
	[ ]	X		=	
	[ ]	X	[ ]	=	
	Sum Column for AC Branch Current Required			=	

6.3 Calculating the System Current Draw

6.3.1 Overview

The control panel must be able to power all internal and external devices continuously during the non-fire alarm condition. To calculate the non-fire alarm load on the system power supply when primary power is applied, use Calculation Column 1 in Table 6-3 on page 124. The control panel must support a larger load current during a fire alarm condition. To calculate the fire alarm load on the power supply, use Calculation Column 2 in Table 6-3 on page 124. The secondary power source (batteries) must be able to power the system during a primary power loss. To calculate the non-fire alarm load on the secondary power source, use Calculation Column 3 in Table 6-3 on page 124.

When calculating current draw and the battery size, note the following:

- 'Primary' refers to the main power source for the control panel
- 'Secondary' refers to the control panel's backup batteries
- All currents are given in amperes (A). Table 6-2 shows how to convert milliamperes and microamperes to full amperes.

TABLE 6-2:Converting to Full Amperes

To convert...	Multiply	Example
Milliamperes (mA) to amperes (A)	mA x 0.001	3 mA x 0.001 = 0.003A
Microamperes (μA) to amperes (A)	μA x 0.000001	300 μA x 0.000001 = 0.0003 A

6.3.2 How to Use Table 6-3 on page 124 to Calculate System Current Draw

Use Table 6-3 on page 124 to calculate current draws as follows:

1. Enter the quantity of devices in all three columns
2. Enter the current draw where required. Refer to the Device Compatibility Document for compatible devices and their current draw
3. Calculate the current draws for each in all columns
4. Sum the total current for each column
5. Copy the totals from Column 2 and Column 3 to Table 6-4 on page 125

Following are the types of current that can be entered into Table 6-3 on page 124:

- ✓ **Calculation Column 1** - The primary supply current load that the control panel must support during a non-fire alarm condition, with AC power applied.
- ✓ **Calculation Column 2** - The primary supply current load that the control panel must support during a fire alarm condition, with AC power applied.
- ✓ **Calculation Column 3** - The standby current drawn from the batteries in a non-fire alarm condition during a loss of AC power.

Table 6-3 contains three columns for calculating current draws. For each column, calculate the current and enter the total (in amperes) in the bottom row. When finished, copy the totals from Calculation Column 2 and Calculation Column 3 to Table 6-4 on page 125.

TABLE 6-3:System Current Draw Calculations

Device Type	Calculation Column 1 Primary, Non-Fire Alarm Current (amps)			Calculation Column 2 Primary, Fire Alarm Current (amps)			Calculation Column 3 Secondary, Non-Fire Alarm Current (amps)		
	Qty	X[current draw]=	Total	Qty	X [current draw] =	Total	Qty	X[current draw]=	Total
Main Circuit Board GF505 GF510	1	X[0.080]=		1	X[0.112][1]=		1	X[0.080]=	
CAC-5X	[ ]	X[0.001]=		[ ]	X[0.001]=			X[0.001]=	
4XTMF	[ ]	X[0.005]=		[ ]	X[0.011][1]=			X[0.005]=	
ANN-LED	[ ]	X[0.028]=		[ ]	X[0.068]=		[ ]	X[0.028]=	
2-wire Detector Heads	[ ]	X[ ][2]=		[ ]	X[ ]=			X[ ]=	
4-wire Detector Heads	[ ]	X[ ][2]=		[ ]	X[ ]=			X[ ]=	
Power Supervision Relays[3]	[ ]	X[0.025]=		[ ]	X[0.025]=			X[0.025]=	
NAC #1[4]				[ ]	X[ ]=				
NAC #2				[ ]	X[ ]=				
NAC #3									
NAC #4									
Current Draw from TB9 (nonalarm[5])		[ ]=			[ ]=			[ ]=	
Sum each column[6] for totals	**Primary Non-Alarm =**			**Primary Alarm =**			**Secondary Alarm =**		

Table Footnote

1. If using the Reverse Polarity Alarm output, add 0.005 amps; if using the Reverse Polarity Trouble output, add another 0.005 amps.
2. Refer to the Device Compatibility Document for standby current.
3. Must use compatible listed Power Supervision Relay.
4. Current limitation of Terminal TB5 circuits is 3.0 amps per NAC for the GF505 & GF510
5. The total standby current must include both the resettable (TB9 Terminals 3 & 4) and nonresettable/resettable (TB9 Terminals 1 & 2) power. Caution must be taken to ensure that current drawn from these outputs during alarm does not exceed maximum ratings specified. Current limitations of TB9, Terminals 1 & 2 = 0.500 amps, filtered, 24 VDC +/-5%, 120 Hz ripple @ 10 mV_{RMS}, nonresettable power and TB9, Terminals 3 & 4 = 0.500 amps, filtered, 24 VDC +/-5%, 120 Hz ripple @ 10mV_{RMS}, resettable power.
6. Total current draw listed above cannot exceed 7.0 amps for GF505 or GF510.

6.4 Calculating the Battery Size

Use Table 6-4 to calculate the total Standby and Alarm load in ampere hours (AH). This total load determines the battery size (in AH), required to support the control panel under the loss of AC power. Complete Table 6-4 as follows:

1. Enter the totals from Table 6-3 on page 124, Calculation Columns 2 and 3 where shown
2. Enter the NFPA Standby and Alarm times (refer to 'NFPA Requirements' below)
3. Calculate the ampere hours for Standby and Alarm, then sum the Standby and Alarm ampere hours
4. Multiply the sum by the derating factor of 1.2 to calculate the proper battery size (in AH)
5. Write the ampere hour requirements on the Protected Premises label located inside the cabinet door

TABLE 6-4:Total Secondary Power Requirements at 24 VDC

Secondary Standby Load (total from Table 6-3 Calculation Column 3) [ ]	Required Standby Time (24 hours) X[ ]	= AH
Primary Alarm Load (total from Table 6-3 Calculation Column 2) [ ]	Required Alarm Time (for 5 min., enter 0.084, for 10 min., enter 0.168) X[ ]	= AH
Sum of Standby and Alarm Ampere Hours		= AH
Multiply by the Derating Factor		X 1.2
Battery Size, Total Ampere Hours Required		= AH

6.4.1 NFPA Battery Requirements

NFPA 72 Local, Central and Proprietary Fire Alarm Systems require 24 hours of standby power followed by 5 minutes in alarm

6.4.2 Selecting and Locating Batteries

Select batteries that meet or exceed the total ampere hours calculated in Table 6-4 . The control panel can charge batteries in the 7 AH to 26 AH range. The control panel cabinet is capable of housing batteries up to 18 AH. Batteries larger than 18 AH require a UL listed external battery cabinet.

APPENDIX A Ademco Contact ID Format Event Code Descriptions

This appendix describes the various Event Codes and their messages which are available for the Ademco Contact ID Format.

A.1 Transmission Format Between DACT and Receiver

The transmission string for the Ademco Contact ID Format is as follows:

SSSS 18 QXYZ GG CCC where

SSSS = Four digit Subscriber ID Account Code

18 = Identifies transmission as Contact ID to the receiver at the Central Station

Q = Event Qualifier where 1 = New Event and 3 = New Restore

XYZ = Event code

GG = Group number

CCC = Zone number

Notes:

1. **18**, which is used in the reporting structure to identify the transmission as Contact ID, is not printed out in the alarm and trouble report.
2. **GG** Group Number is fixed at '00' and cannot be changed.
3. **CCC** for Zone Number is transmitted as '001' for zone 1 up to '010' for zone 10

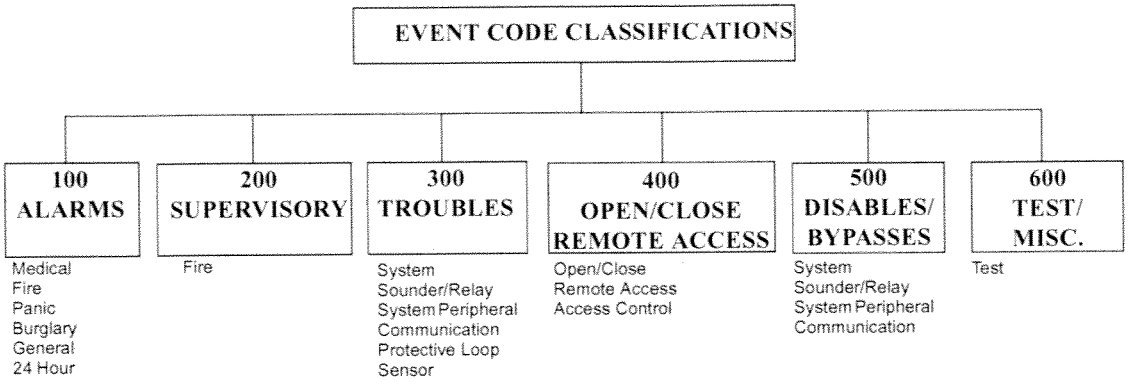
A.2 Ademco Contact ID Typical Printout

A typical printout from a Central Station receiver (such as the Ademco 685) of alarm and trouble reports in the Ademco Contact ID Reporting Structure follows:

Time	Date	Rcvr/Line ID	SSSS	QXYZ	GG	CCCC
11:28	03/25	11	7777	E110	00	C001 - general fire alarm on zone one
11:28	03/25	11	7777	E111	00	C002 - smoke detector alarm on zone two
11:28	03/25	11	7777	E380	00	C003 - fault on zone three
11:28	03/25	11	7777	E570	00	C009 - Zone nine disabled
11:28	03/25	11	7777	R110	00	C001 - Zone one alarm restored
11:28	03/25	11	7777	R111	00	C002 - smoke detector zone two restored
11:28	03/25	11	7777	R380	00	C003 - zone three fault restored
11:28	03/25	11	7777	R570	00	C009 - zone nine reenabled
11:28	03/25	11	7777	E158	00	C006 - high temperature, zone six
11:28	03/25	11	7777	E151	00	C007 - gas detected, zone seven

Notes:

1. **11** is an example of a Receiver/Line Card, showing which receiver and line card the message was transmitted to.
2. **Q**, which is the Event Qualifier for the reporting structure, is printed out in the report as an **E** for New Event or R for New Restore.



EVENT	MESSAGE
Medical Alarms - 100	
100 Medical	EMERG - Personal Emergency - #
101 Pendant transmitter	EMERG - Personal Emergency - #
102 Fail to report in	EMERG - Fail to Check-in - #
Fire Alarms - 110	
110 Fire Alarm	FIRE - Fire Alarm - #
111 Smoke	FIRE - Smoke Detector - #
112 Combustion	FIRE - Combustion - #
113 Waterflow	FIRE - Waterflow - #
114 Heat	FIRE - Heat Sensor - #
115 Pull station	FIRE - Pull Station - #
116 Duct	FIRE - Duct Sensor - #
117 Flame	FIRE - Flame Sensor - #
118 Near Alarm	FIRE - Near Alarm - #
Panic Alarms - 120	
120 Panic Alarm	PANIC - Panic - #
121 Duress	PANIC - Duress
122 Silent	PANIC - Silent Panic - #
123 Audible	PANIC - Audible Panic - #
Burglar Alarms - 130	
130 Burglary	BURG - Burglary - #
131 Perimeter	BURG - Perimeter - #
132 Interior	BURG - Interior - #
133 24-Hour	BURG - 24-Hour - #
134 Entry/Exit	BURG - Entry/Exit - #
135 Day/Night	BURG - Day/Night - #
136 Outdoor	BURG - Outdoor - #
137 Tamper	BURG - Tamper - #
138 Near Alarm	BURG - Near Alarm - #
General Alarms - 140	
140 General Alarm	ALARM - General Alarm - #
141 Polling loop open	ALARM - Polling Loop Open - #
142 Polling loop short	ALARM - Polling Loop Short - #
143 Expansion module failure	ALARM - Exp. Module Fail - #
144 Sensor tamper	ALARM - Sensor Tamper - #
145 Expansion module tamper	ALARM - Exp. Module Tamper - #

EVENT	MESSAGE
24 Hour Non-Burglary - 150 and 160	
150 24-Hour Non-Burg	ALARM - 24-Hr. Non-Burg - #
151 Gas detected	ALARM - Gas Detected - #
152 Refrigeration	ALARM - Refrigeration - #
153 Loss of heat	ALARM - Heating System - #
154 Water leakage	ALARM - Water Leakage - #
155 Foil break	ALARM - Foil Break - #
156 Day trouble	ALARM - Day Zone - #
157 Low bottled gas level	ALARM - Low Gas Level - #
158 High temp	ALARM - High Temperature - #
159 Low temp	ALARM - Low Temperature - #
161 Loss of air flow	ALARM - Air Flow - #
Fire Supervisory - 200 and 210	
200 Fire supervisory	SUPER. - Fire Supervisory - #
201 Low water pressure	SUPER. - Low Water Pressure - #
202 Low CO2	SUPER. - Low CO2
203 Gate valve sensor	SUPER. - Gate Valve - #
204 Low water level	SUPER. - Low Water Level - #
205 Pump activated	SUPER. - Pump Activation - #
206 Pump failure	SUPER. - Pump Failure - #
System Troubles - 300 and 310	
300 System trouble	TROUBLE - System Trouble
301 AC loss	TROUBLE - AC Power
302 Low system battery	TROUBLE - System Low Battery
303 RAM checksum bad	TROUBLE - Bad RAM Checksum (restore not applicable)
304 ROM checksum bad	TROUBLE - Bad ROM Checksum (restore not applicable)
305 System reset	TROUBLE - System Reset (restore not applicable)
306 Panel program changed	TROUBLE - Programming Changed (restore not applicable)
307 Self-test failure	TROUBLE - Self Test Failure
308 System shutdown	TROUBLE - System Shutdown
309 Battery test failure	TROUBLE - Battery Test Failure
310 Ground fault	TROUBLE - Ground Fault - #
311 No battery	TROUBLE - No Battery
Sounder/Relay Troubles - 320	
320 Sounder/Relay	TROUBLE - Sounder Relay - #
321 Bell 1	TROUBLE - Bell/Siren #1
322 Bell 2	TROUBLE - Bell/Siren #2
323 Alarm relay	TROUBLE - Alarm Relay
324 Trouble relay	TROUBLE - Trouble Relay
325 Reversing	TROUBLE - Reversing Relay
326 Bell 3	TROUBLE - Bell/Siren #3
327 Bell 4	TROUBLE - Bell/Siren #4
System Peripheral Troubles - 330 and 340	
330 System peripheral	TROUBLE - Sys. Peripheral - #
331 Polling loop open	TROUBLE - Polling Loop Open
332 Polling loop short	TROUBLE - Polling Loop Short
333 Expansion module failure	TROUBLE - Exp. Module Fail - #
334 Repeater failure	TROUBLE - Repeater Failure - #
335 Local printer paper out	TROUBLE - Printer Paper Out
336 Local printer failure	TROUBLE - Local Printer

EVENT	MESSAGE		
Communication Troubles - 350 and 360			
350 Communication	TROUBLE - Communication Trouble		
351 Telco 1 fault	TROUBLE - Phone Line #1		
352 Telco 2 fault	TROUBLE - Phone Line #2		
353 Long range radio xmitter fault	TROUBLE - Radio Transmitter		
354 Fail to communicate	TROUBLE - Fail to Communicate		
355 Loss of radio supervision	TROUBLE - Radio Supervision		
356 Loss of central polling	TROUBLE - Central Radio Polling		
Protection Loop Troubles - 370			
370 Protection loop	TROUBLE - Protection Loop - #		
371 Protection loop open	TROUBLE - Protection Loop Open - #		
372 Protection loop short	TROUBLE - Protection Loop Short - #		
373 Fire Trouble	TROUBLE - Fire Loop - #		
Sensor Troubles - 380			
380 Sensor trouble	TROUBLE - Sensor Trouble - #		
381 Loss of supervision - RF	TROUBLE - RF Sensor Supervision - #		
382 Loss of supervision - RPM	TROUBLE - RPM Sensor Supervision - #		
383 Sensor tamper	TROUBLE - Sensor Tamper - #		
384 RF transmitter low battery	TROUBLE - RF Sensor Batt. - #		
Open/Close - 400			
400 Open/Close	OPENING	CLOSING	
401 Open/Close by user	OPENING - User #	CLOSING - User #	
402 Group Open/Close	OPENING - Group User #	CLOSING - Group User #	
403 Automatic Open/Close	OPENING - Automatic	CLOSING - Automatic	
404 Late Open/Close	OPENING - Late	CLOSING - Late	
405 Deferred Open/Close	Opening not used	Closing not used	
406 Cancel	OPENING - Cancel	Closing not used	
407 Remote arm/disarm	OPENING - Remote	CLOSING - Remote	
408 Quick arm	Opening not applicable	CLOSING - Quick arm	
409 Keyswitch Open/Close	OPENING - Keyswitch	CLOSING - Keyswitch	
Remote Access - 410			
411 Callback request made	REMOTE - Callback Requested		(restore not applicable)
412 Success - download/access	REMOTE - Successful Access		(restore not applicable)
413 Unsuccessful access	REMOTE - Unsuccessful Access		(restore not applicable)
414 System shutdown	REMOTE - System Shutdown		
415 Dialer shutdown	REMOTE - Dialer Shutdown		
416 Success - upload/access	REMOTE - Successful Access		(restore not applicable)
Access Control - 420			
421 Access denied	ACCESS - Access Denied - User #		(restore not used)
422 Access report by user	ACCESS - Access Gained - User #		(restore not used)
System Disables - 500 and 510			

EVENT	MESSAGE	
Sounder/Relay Disables - 520		
520 Sounder/Relay disable	DISABLE - Sounder/Relay - #	
521 Bell 1 disable	DISABLE - Bell/Siren - #1	
522 Bell 2 disable	DISABLE - Bell/Siren - #2	
523 Alarm relay disable	DISABLE - Alarm Relay	
524 Trouble relay disable	DISABLE - Trouble Relay	
525 Reversing relay disable	DISABLE - Reversing Relay	
526 Bell 3 disable	DISABLE - Bell/Siren - #3	
527 Bell 4 disable	DISABLE - Bell/Siren - #4	
System Peripheral Disables - 530 and 540		
Communication Disables - 550 and 560		
551 Dialer disabled	DISABLE - Dialer Disable	
552 Radio transmitter disabled	DISABLE - Radio Disable	
Bypasses - 570		
570 Zone bypass	BYPASS - Zone Bypass - #	
571 Fire bypass	BYPASS - Fire Bypass - #	
572 24-Hour zone bypass	BYPASS - 24-Hour Bypass - #	
573 Burglar bypass	BYPASS - Burg. Bypass - #	
574 Group bypass	BYPASS - Group Bypass - #	
Test Misc. - 600		
601 Manual trigger test	TEST - Manually Triggered	(restore not applicable)
602 Periodic test report	TEST - Periodic	(restore not applicable)
603 Periodic RF transmission	TEST - Periodic Radio	(restore not applicable)
604 Fire test	TEST - Fire Test	(restore not used)
605 Status report to follow	STATUS - Status Follows	(restore not applicable)
606 Listen-in to follow	LISTEN - Listen-in Active	(restore not applicable)
607 Walk test mode	TEST - Walk Test Mode	
608 System abnormal test	TEST - System Abnormal Test	

APPENDIX B NFPA Standard-Specific Requirements

The GF505/GF510 has been designed for use in commercial, industrial and institutional applications and meets the requirements for service under the National Fire Protection Association (NFPA) Standards outlined in this Appendix. The minimum system components required for compliance with the appropriate NFPA standard are listed below:

GF505/GF510 Control Panel

Contains the main control board, cabinet (backbox and door), main power supply and transformer.

Batteries

Refer to "Power Supply Calculations" on page 122, for Standby Power Requirements.

Initiating Devices

Connected to one of the control panel's Initiating Device Circuits.

Notification Appliances

Connected to the control panel's Notification Appliance Circuits via a control module.

The following additional equipment is needed for compliance with the NFPA 72 standards listed below:

NFPA 72 NATIONAL FIRE ALARM STANDARDS FOR:

NFPA 72 Central Station Service (Protected Premises Unit) or Remote Station Service

Onboard Digital Alarm Communicator Transmitter for connection to a compatible listed Central Station DACR or Protected Premises Receiving Unit. This unit must be installed as outlined in "Digital Alarm Communicator/Transmitter" on page 17.

OR

411UD may be installed as illustrated in Figure B.1, "GF505/GF510 FACP Connection to 411UD," on page 132.

OR

4XTMF Transmitter Module for connection to the RS82 Remote Station Receiver. See Figure B.3, "Remote Station Connection Using 4XTMF Module," on page 135, for installation instructions for this unit.

NFPA 72 Auxiliary Fire Alarm System

4XTMF Transmitter Module for connection to a compatible listed Local Energy Municipal Box. This unit must be installed as illustrated in the section titled "4XTMF Transmitter Module Installation" on page 35 and as outlined in Figure B.2, "Municipal Box Connected to 4XTMF Transmitter Module," on page 134.

NFPA 72 Proprietary Fire Alarm System

GF505/GF510 Alarm, Trouble and Supervisory contacts connected to Transmitter(s). See Figure B.4, "Proprietary Protective Signaling System," on page 136, for installation instructions for this unit.

The following figure illustrates an example of Central Station/Remote Station Reporting using a 411UD. The relay contacts from the GF505/GF510 may be used to trip any dialer UL listed for Central Station/Remote Station Reporting Services.

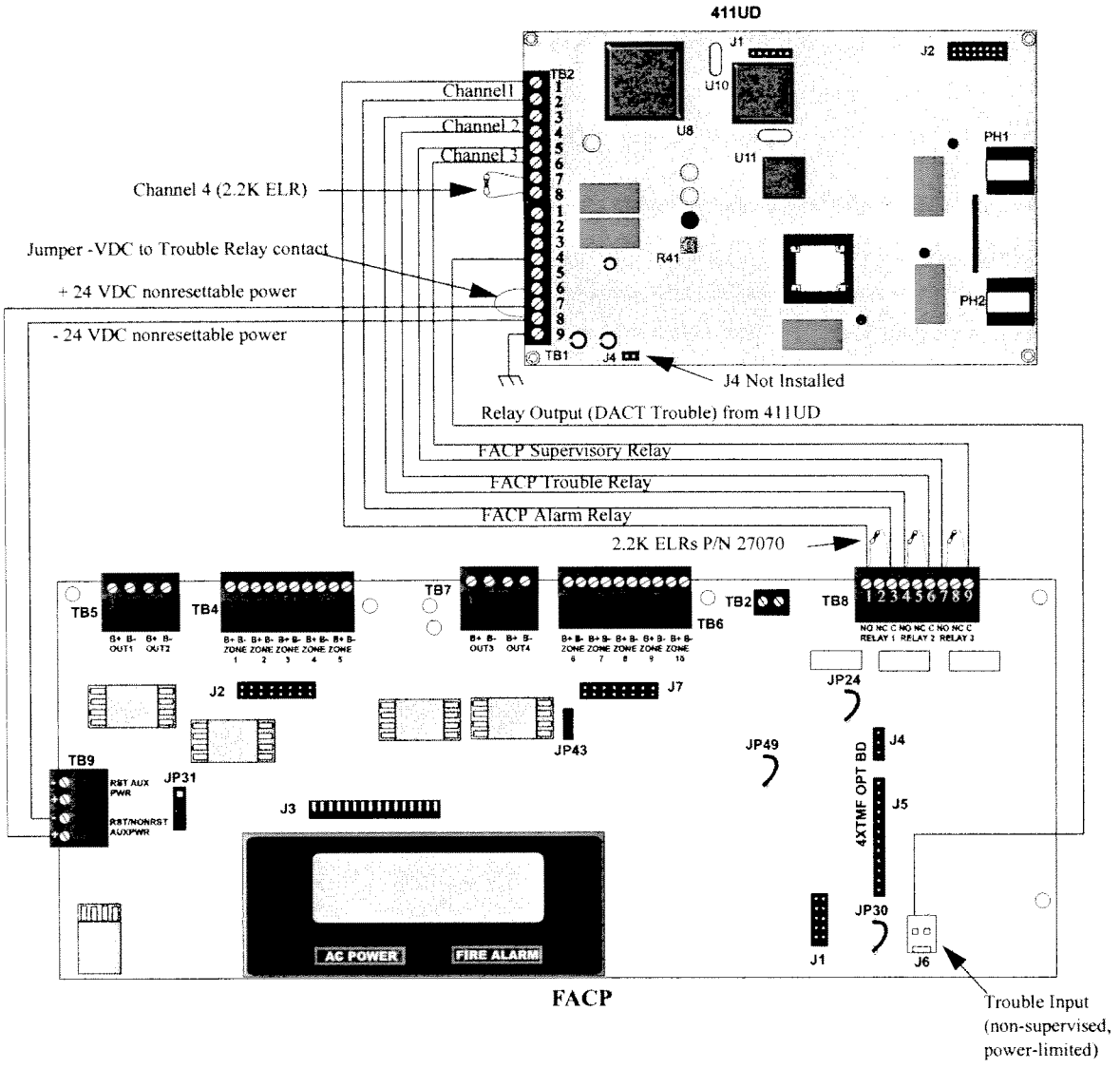


Figure B.1 GF505/GF510 FACP Connection to 411UD

	411UD	FACP
Alarm	TB2-1	TB8-1
	TB2-2	TB8-3
Trouble	TB2-3	TB8-4
	TB2-4	TB8-6
Supervisory	TB2-5	TB8-7
	TB2-6	TB8-9

Table B.1 411UD Connections to FACP

Notes:

1. Reference the 411UD Manual for additional information
2. Program the 411UD for slave operation
3. The GF505/GF510 must be programmed for AC Loss Reporting Delay This prevents the immediate transmission of a trouble on the loss of AC power
4. All connections between the control panel and the 411UD must be in conduit, less than 20 feet (610 cm) in length, in the same room
5. Any zone of the 411UD can be wired to function as alarm, trouble or supervisory. In Figure B.1 on page 132, Channel 1/Zone 1 is wired to the control panel's alarm relay, Channel 2/ Zone 2 is wired to the control panel's trouble relay and Channel 3/Zone 3 is wired to the control panel's supervisory relay
6. Nonresettable 24 VDC power is supplied to the 411UD via TB9 terminals configured for nonresettable power on the FACP. Jumper J4 on the 411UD must be removed for 24 VDC power
7. End-of-Line resistors must terminate all 411UD circuits, including unused circuits
8. A -VDC from the 411UD Trouble Contacts will activate the Trouble Input J6 on the FACP

NFPA 72 Auxiliary Fire Alarm System

All connections are power-limited and supervised. This application is not suitable for separate transmission of sprinkler supervisory or trouble conditions.

Notes:

1. 3 ohms maximum loop resistance allowed for wiring from control panel to Municipal Box.
2. Cut JP30 on the GF505/GF510 main circuit board to supervise placement of 4XTMF module and circuit.
3. Cut JP24 on the GF505/GF510 main circuit board to enable FACP Supervisory relay.
4. Refer to "4XTMF Transmitter Module Installation" on page 35 for detailed information.

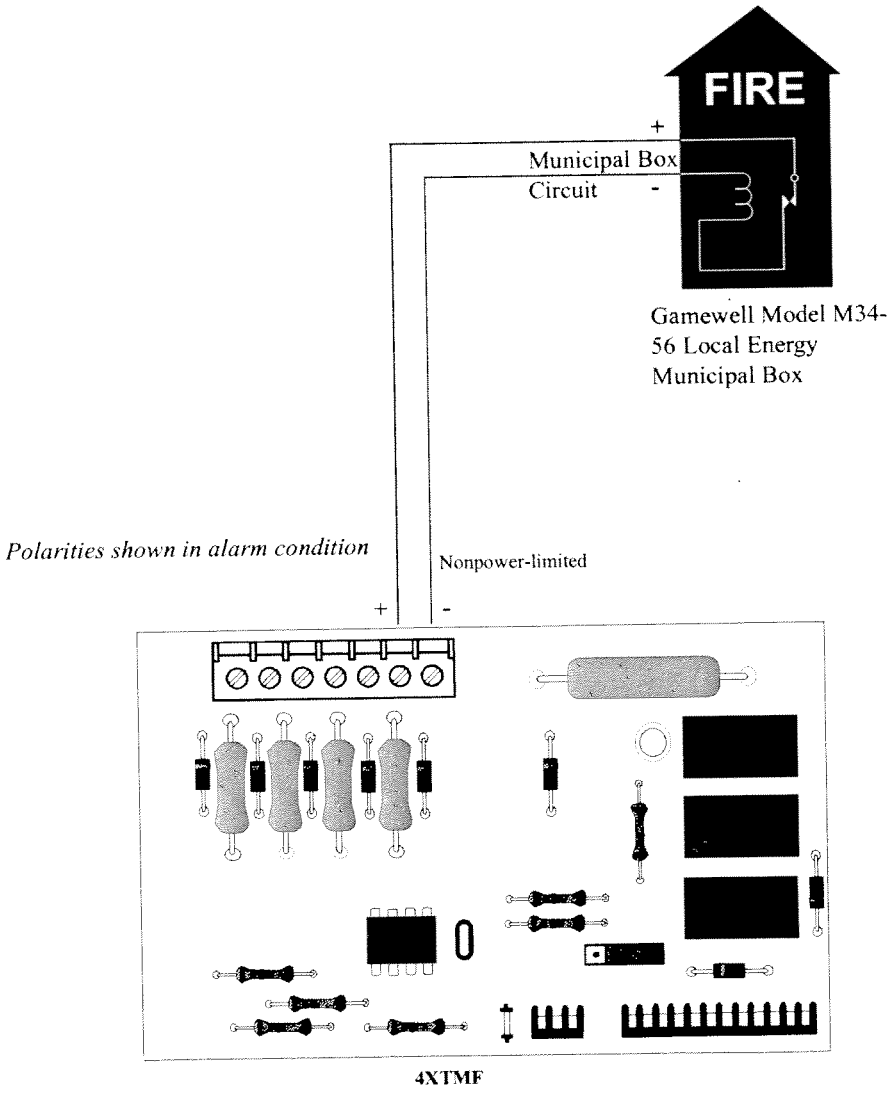


Figure B.2 Municipal Box Connected to 4XTMF Transmitter Module

NFPA 72 Remote Station Protective Signaling System

Notes:

1. Cut Jumper JP30 on the GF505/GF510 main circuit board to supervise placement of the 4XTMF module.
2. Refer to "4XTMF Transmitter Module Installation" on page 35 for detailed information.

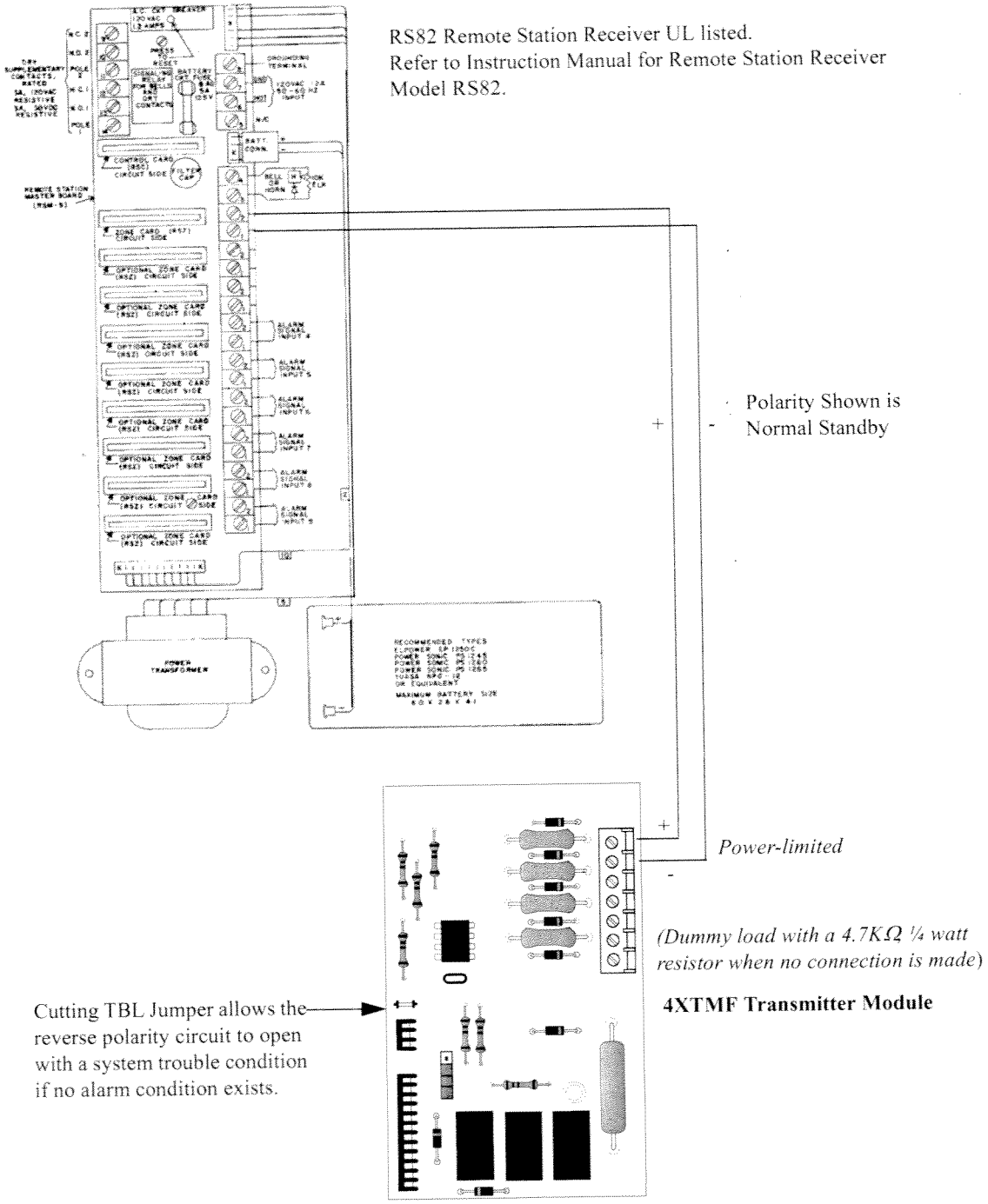
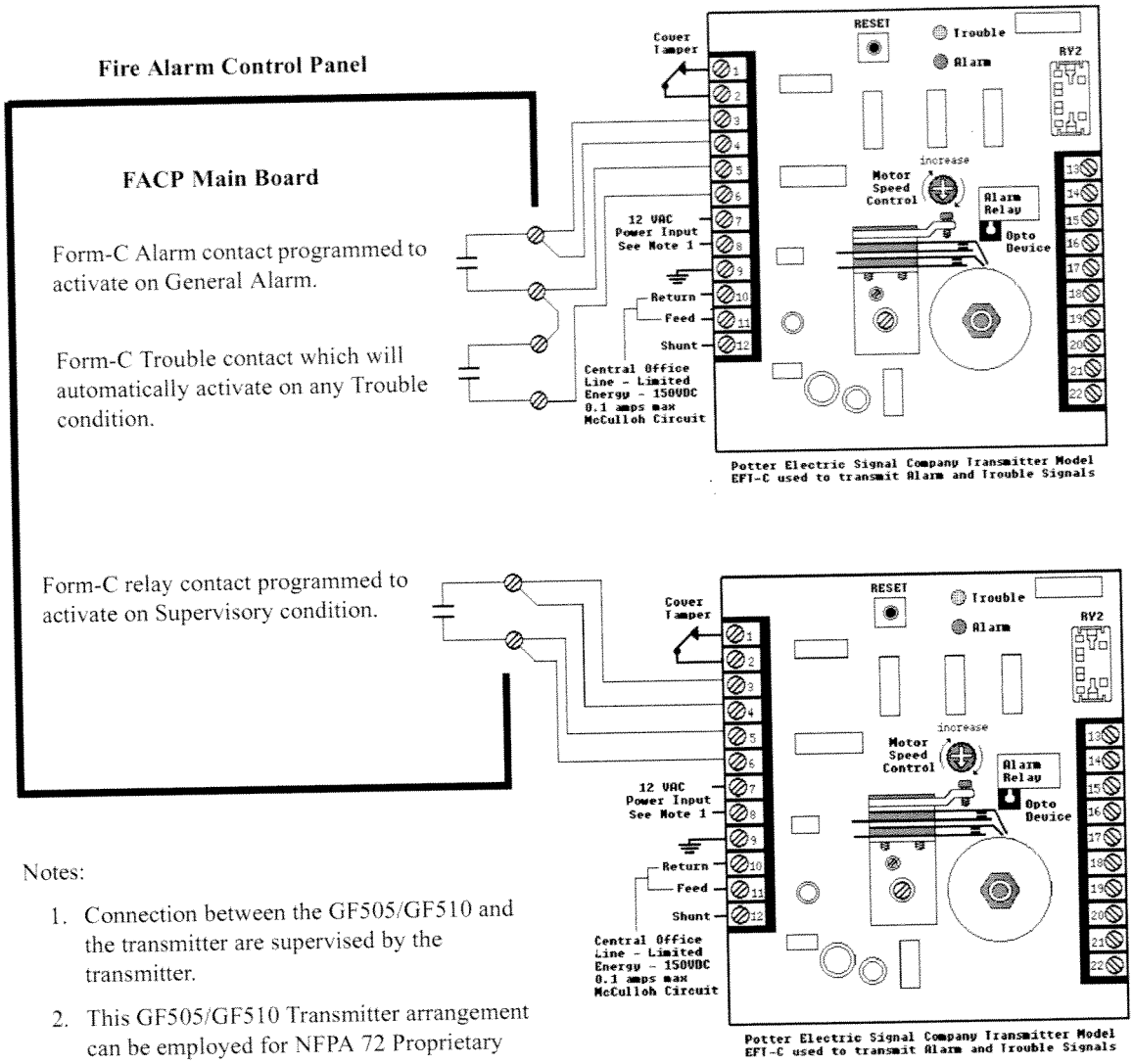


Figure B.3 Remote Station Connection Using 4XTMF Module

NFPA 72 Proprietary Protective Signaling Systems



Notes:

1. Connection between the GF505/GF510 and the transmitter are supervised by the transmitter.
2. This GF505/GF510 Transmitter arrangement can be employed for NFPA 72 Proprietary Protective Signaling System.

Figure B.4 Proprietary Protective Signaling System

B.1 Central Station/Remote Station Transmitter: Connection to FACP Dry Contacts

The dry contacts of the FACP programmable relays can be used to trip a UL-864 Listed Central Station/Remote Station Transmitter. The FACP contacts must be supervised by the Central Station/ Remote Station Transmitter module using End-of-Line Resistors (ELRs) with a value determined by the Transmitter manufacturer. Power is also provided by the Central Station/Remote Station Transmitter manufacturer. Refer to the Central Station/Remote Station Transmitter manufacturer's manual for details.

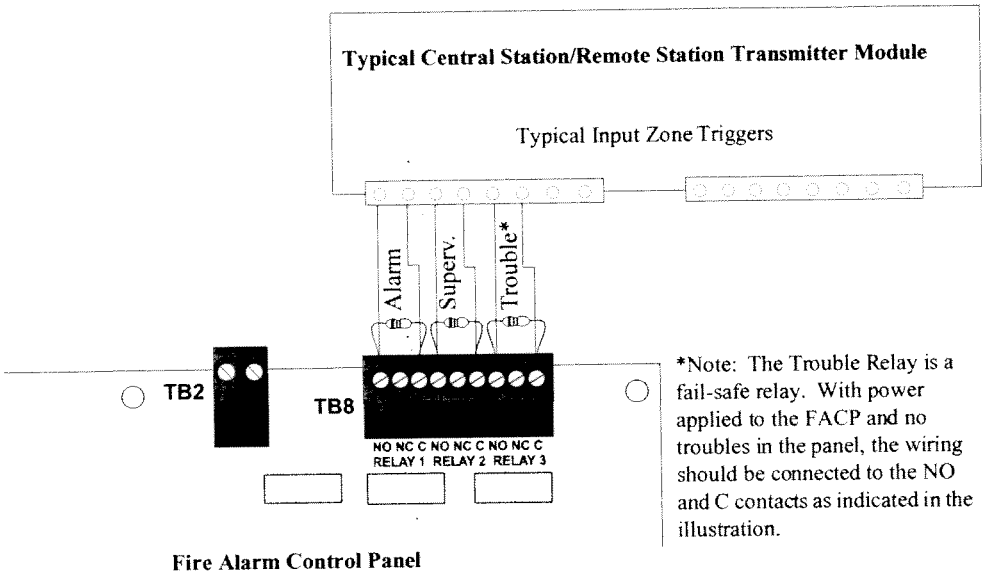


Figure B.5 FACP Dry Contacts Connection to Central Station/Remote Station Transmitter

APPENDIX C FACP with Keltron

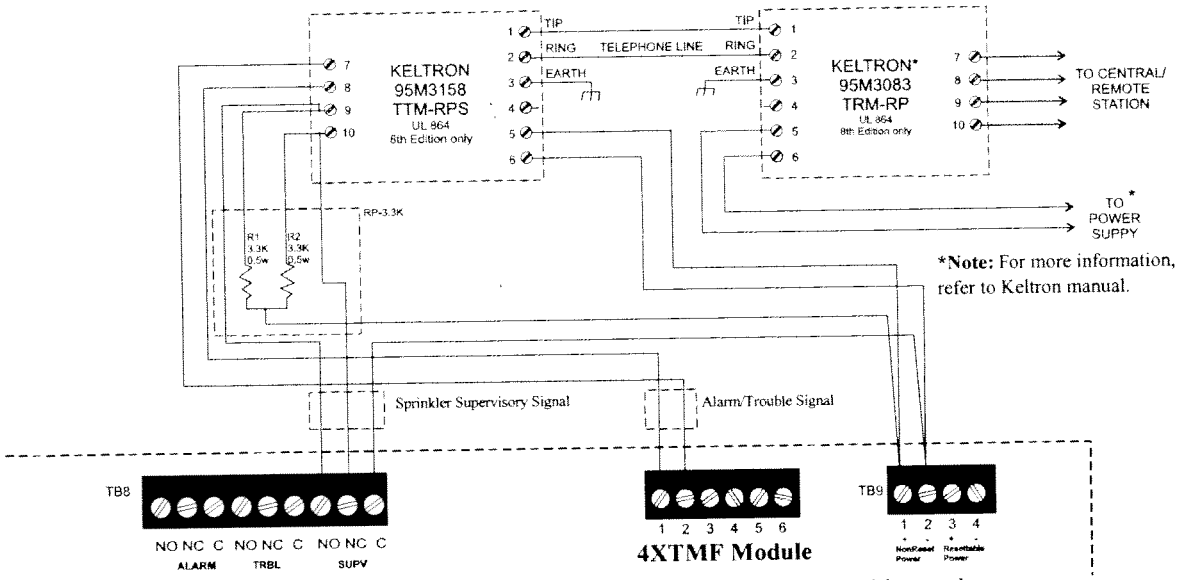
The following figure illustrates the connections between the FACP and Keltron Receiver/ Transmitter.

CAUTION! For reasons of wiring diagram clarity, terminal designations of Keltron modules are not shown in actual order. Follow Keltron manual and module markings for exact terminal locations to prevent severe module damage!

IMPORTANT! All connections between the FACP and Keltron modules must be made within 20 feet and enclosed within conduit or equivalently protected against mechanical injury.

Keltron 95M3158 TTM-RPS

1. Terminals 7 and 8: Remote station alarm/trouble inputs.
2. Terminals 9 and 10: Sprinkler supervisory input.



Note: Cut TBL jumper on 4XTMF module to send alarm/trouble signal from the same pair or terminals.

Fire Alarm Control Panel
(terminal blocks are not shown in their actual positions in order to clarify wiring connections)

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D-17
Security Alarm

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K5309-1V5 11/06 Rev A

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ADEMCO VISTA SERIES

VISTA-20P / VISTA-20PSIA
VISTA-15P / VISTA-15PSIA

Security Systems

Bill-
1576 946-0312

101 Fairchild Ave
Plainview

User Guide

K5309-1V5 11/06 Rev. A

IMPORTANT!

PROPER INTRUSION PROTECTION

For proper intrusion coverage, sensors should be located at *every possible point of entry* to a home or commercial premises. This would include any skylights that may be present, and the upper windows in a multi-level building.

In addition, we recommend that radio backup be used in a security system so that alarm signals can still be sent to the Central Monitoring Station in the event that the telephone lines are out of order (alarm signals are normally sent over the phone lines).

EARLY WARNING FIRE DETECTION

Early warning fire detection is important in a home. Smoke and heat detectors have played a key role in reducing fire deaths in the United States. With regard to the number and placement of smoke/heat detectors, we subscribe to the recommendations contained in the National Fire Protection Association's National Fire Alarm Code (NFPA 72). These recommendations can be found on page 47 of this manual.

SYSTEM COMPATIBILITY NOTICE

Your Honeywell security system is designed for use with devices manufactured or approved by Honeywell for use with your security system. Your Honeywell security system is not designed for use with any device that may be attached to your security system's keypad or other communicating bus if Honeywell has not approved such device for use with your security system. Use of any such unauthorized device may cause damage or compromise the performance of your security system and affect the validity of your Honeywell limited warranty. When you purchase devices that have been manufactured or approved by Honeywell, you acquire the assurance that these devices have been thoroughly tested to ensure optimum performance when used with your Honeywell security system.

About This Manual

This manual is a step-by-step guide that will acquaint you with the system's features and benefits. It defines the components and their functions, describes their operation, and provides clear step-by-step instructions for normal and emergency procedures. Keep this manual in a convenient place so that you can refer to it as necessary.

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System Overview

Introduction

Congratulations on your ownership of a Honeywell Security System. You've made a wise decision in choosing it, for it represents the latest in security protection technology today. This system provides:

- Three forms of protection: burglary, fire* and emergency
- At least one keypad which provides control of system and displays system status
- Various sensors for perimeter and interior burglary protection
- Smoke or combustion detectors* designed to provide early warning in case of fire.

Your system may also have been programmed to automatically send alarm or status messages over the phone lines to a Central Monitoring Station.

** Commercial installations and some residential systems may not include fire protection – check with your installer.*

NOTE: Features and procedures described in this manual apply to the VISTA-20P/VISTA-20PSIA (VISTA-20P series) and VISTA-15P/VISTA-15PSIA (VISTA-15P series) security systems. Differences are noted where applicable.

System Basics

Burglary Protection

- Several modes of burglary protection: Stay, Night-Stay, Away, Instant, Maximum.
  STAY: arms perimeter zones only and entry delay is on
  INSTANT: same as STAY, except entry delay is off
  NIGHT-STAY: arms perimeter zones and selected interior zones; entry delay on
  AWAY: arms perimeter and all interior zones, entry delay is on
  MAXIMUM: same as AWAY, except entry delay is off
- You can BYPASS selected zones while leaving the rest of the system armed
- CHIME mode alerts you to the opening of protected doors and windows while the system is disarmed.

Fire Protection

- Fire protection is always active (if installed) and an alarm sounds if a fire condition is detected
- If necessary, you can manually initiate a fire alarm using the keypad (if programmed).
- Refer to the Fire Alarm System section for information regarding fire protection, smoke detectors and planning emergency exit routes.

Security Codes

- You were assigned a 4-digit security code (master code) during installation.
- Use your security code when arming and disarming the system, and when performing other system functions.
- Other users can be assigned different security codes, each with different authority levels, which define the system functions a particular user can perform

System Overview (cont'd)

Zones and Partitions

- The system sensing devices have been assigned to various "zones," which are specific areas of protection (e.g., front door, kitchen window, etc.).
- Zone numbers are displayed at the keypad when an alarm or trouble condition occurs on a sensor.
- Partitions (VISTA-20P Series) provide two independent areas of protection, with each partition containing a group of zones that can be armed and disarmed without affecting other zones or users.
- Partitioned systems (VISTA-20P Series) can include a common zone area, which is an area shared by users of both partitions (such as a lobby in a building).

Arming, Step-Arming and Disarming Burglary Protection

- The system must be armed before the burglary protection can sense intrusions.
- To arm your system, enter your user code followed by the desired arming key.
- If programmed, you can press the [#] key in place of your security code when arming the system (e.g., instead of entering your 4-digit security code + [3-STAY] to arm the system in STAY mode, you can press [#] + [3-STAY]).
- You can also use the step-arming feature if programmed, to arm the system. This is a function key that allows you to arm the system in one of three modes by simply pressing the key repeatedly.
- To disarm the system, enter your security code then press the [OFF] key.

Alarms

- When an alarm occurs, both the keypad and external sounders sound, and the keypad displays the zone(s) causing the alarm.
- If your system is connected to a Central Monitoring Station, an alarm message is also sent. (**Delayed Reporting Note:** Message reporting is delayed 30 seconds by default to reduce false alarms. If desired, this delay can be removed or can be increased to 45 seconds. See your installer if you want the delay time changed.)
- To stop the alarm sounding, simply disarm the system.

Memory of Alarm

- When an alarm condition occurs, the keypad displays the number(s) of the zone(s) that caused the problem, and displays the type of alarm.
- The message remains displayed even after disarming the system, but can be cleared with another "off" sequence.

Phone Access

- If included, a phone module permits you to access the system via a touch-tone phone, either on-premises or by call-in when away.
- When you call in, the phone module announces system status over the telephone, and you can arm/disarm the system and perform most function commands remotely using the telephone keys.
- Complete information for using these features is provided with the voice module.

System Overview (cont'd)

Function Keys

- The "A," "B," "C," and "D" keys can be programmed to perform various functions.
- Functions include: activate a panic alarm, arm the system, provide step arming, switch lights on/off, send a message to a pager, display Time/Date, and start a programmed Macro sequence.

Paging Feature

- If programmed, the system can automatically send certain system condition messages to up to four (VISTA-20P Series) or two (VISTA-15P Series) pagers.
- The pager displays code numbers identifying the type of condition that has occurred.

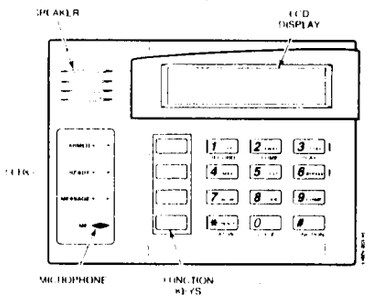
Scheduling

- Your system can be programmed to automatically perform certain functions (e.g., arm the system) at a predetermined time each day.

Using the Voice Message Center (if Voice Keypad is installed)

Voice keypads feature a voice message center that lets you record and playback one message.

- The message can be up to 2.5-minutes long
- The message remains in memory until a new message is recorded.
- The volume control is adjustable.
- Refer to the procedures below when using the Message Center functions.



Message Center Functions

To...	Press these keys...	Notes...
record a message	[#] FUNCTION + [0] VOICE + [1 OFF] RECORD	The red MESSAGE LED lights. Message remains in memory until a new message is recorded.
end recording	[1 OFF] RECORD	The red MESSAGE LED flashes, indicating message waiting.
play a message	[#] FUNCTION + [0] VOICE + [3 STAY] PLAY	The recorded message plays and the red MESSAGE LED turns off.
adjust the volume	[#] FUNCTION + [0] VOICE + [2 AWAY] VOLUME, then press volume key [3] ↑ (up) or [6] ↓ (down)	Adjusting message volume also adjusts status volume. Volume cannot be adjusted while playing.

About The Keypads

General Information

Your keypads allow you to control all system functions and feature the following:

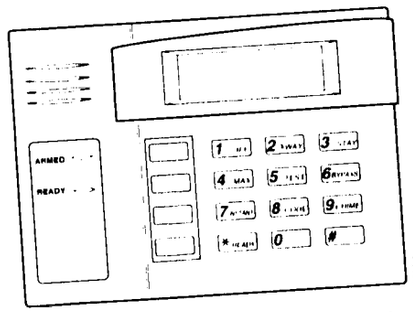
- A telephone style (digital) keypad
- Liquid Crystal Displays (LCD) that show the nature and location of all occurrences
- Built-in sounder that sounds during alarms and troubles. The sounder also "beeps" during certain system functions and also when depressing any of the keys (to acknowledge the key press).
- Backlighting of the LCD display windows. Backlighting turns on when any key is pressed or when entering the premises through any assigned entry/exit door. This feature is helpful when a keypad is located in a dimly lit area.
- Some keypads have a voice feature that announces the nature and location of all system occurrences. Voice keypads also announce any faulted entry/exit or perimeter zone when Chime mode is on. Ask your installer if this option has been programmed for your system.

IMPORTANT: If the keypad beeps rapidly upon entering the premises, it indicates that an alarm has occurred during your absence and an intruder may still be on the premises. LEAVE IMMEDIATELY and CONTACT THE POLICE from a nearby safe location.

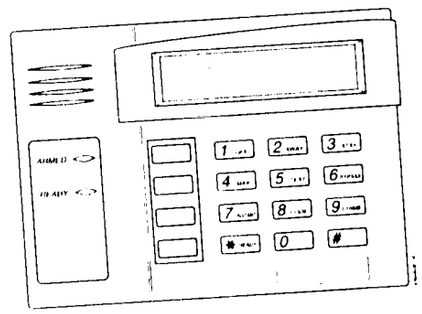
Your keypads are functionally the same, but may have different types of displays, depending on the type installed with your system.

Alpha Display	2 line alpha display keypads feature a 2-line, 32-character alphanumeric LCD that displays system messages in friendly English. These keypads can also be programmed with custom zone descriptors.
Fixed-Word Display	Fixed-Word display keypads are functionally identical to Alpha display keypads, but the LCD display uses pre-designated words to identify the nature and location of occurrences.
Voice Keypads	Voice Keypads (if installed), are functionally the same as other keypads, except that these keypads can provide the following: • Voice announcements of system status (see *Checking for Open Zones* section) • Voice chime, which can alert you to the opening of doors and windows while the system is disarmed (see Voice Chime in *Chime mode* section) • Message center, which lets you record and playback messages (see Using the Voice Message Center in the *System Overview* section).

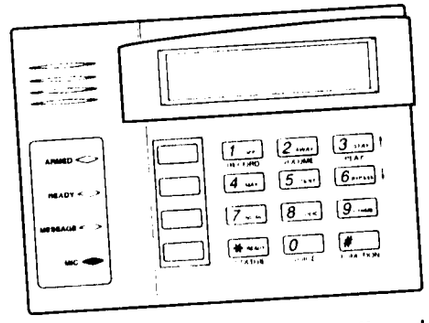
About The Keypads (cont'd)



Standard Fixed-Word Display Keypad



Standard Alpha Display Keypad



Voice-Capable Alpha Display Keypad

About The Keypads (Cont'd)

FIXED-WORD DISPLAY KEYPAD

FIXED-WORD DISPLAY

AWAY: All burglary zones, interior and perimeter, are armed.

STAY: Perimeter burglary zones, such as protected windows and doors, are armed.

NIGHT-STAY: When specific interior zones are armed and all others bypassed, the NIGHT and STAY indicators are both on.

INSTANT: Entry delay is turned off:
Lit with STAY = Instant mode
Lit with AWAY = Maximum mode

BYPASS: This appears when one or more burglary protection zones have been bypassed.

NOT READY: Appears when burglary portion of the system is not ready for arming (due to open protection zones). The system is ready to arm when this message disappears and the READY indicator light comes on.

NO AC: Appears when AC power has been cut off. System is operating on backup battery power.

AC: Appears when AC power is present.

CHIME: Appears when the chime feature is activated.

BAT: Low battery condition in a wireless sensor (if zone number displayed) or low system battery (if no zone number displayed).

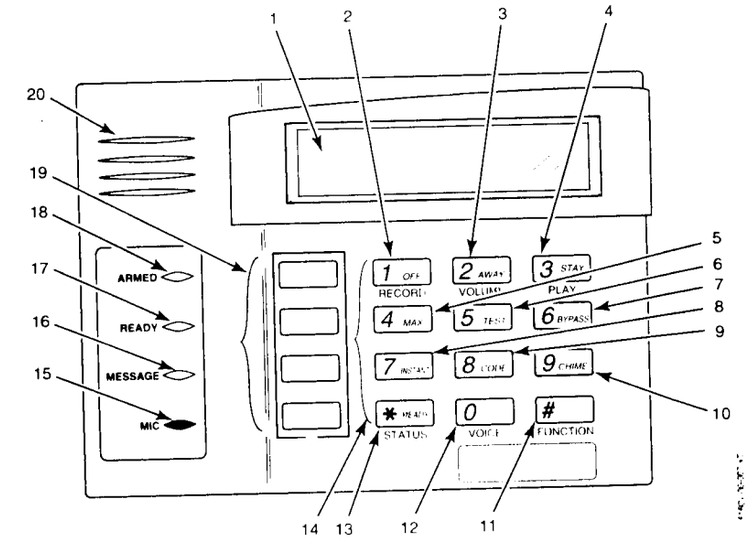
ALARM: Appears when an intrusion has been detected and the system is armed (also appears during a fire alarm or audible emergency alarm). Accompanied by the protection zone in alarm.

CHECK: Appears when a malfunction is discovered in the system at any time, or if an open is detected in a fire zone at any time, or a fault in a DAY/NIGHT burglary zone during a disarmed period. Accompanied by a display of zone number in trouble.

FIRE: Appears when a fire alarm is generated. Accompanied by a display of the zone in alarm.
A FIRE display also appears when a fire alarm is manually activated, accompanied by a display of the fire emergency key zone number.

CANCELED: Appears when an alarm has been silenced by the Code + OFF sequence and will remain on until another Code + OFF sequence is keyed.

Functions of the Keypads



Voice-capable 2-line Alpha keypad
(shown with flip-down front door removed)

IMPORTANT!

- Match the numerical callouts in the above graphic with the corresponding number on the following pages for a description of usage.
- When entering codes and commands, sequential key depressions must be made within 4-5 seconds of one another. If 4-5 seconds elapse without a key depression, the entry will be aborted and must be repeated from its beginning. Be sure to observe this precaution when performing any of the procedures in this manual.
- If you make a mistake while entering a **security** code, stop, press the [✱] key, and then start over. If you stop in the middle while entering a code, and then immediately start the entry over, an erroneous code might be entered.

Functions of the Keypads (cont'd)

NOTE: The functions printed directly on the keys indicate their primary purpose; the functions printed under some of the keys (shown in brackets under the respective key), indicate their alternate or secondary purpose.

1. **DISPLAY WINDOW**

   Alpha Display Keypads: 2-line, 32-character Liquid Crystal Display (LCD) keypads that display protection point identification, system status, and messages.

   Fixed-Word Display Keypads: Display protection zone ID and system status messages using pre-designated words in the LCD display area.

2. [1 OFF] Disarms burglary portion of the system, silences alarms and audible trouble indicators, and clears visual display after problem's correction.

   [RECORD] On Voice keypads, used in conjunction with the FUNCTION and VOICE keys to record up to a 2.5-minute message.

3. [2 AWAY] Arms the entire burglary system, perimeter and interior.

   [VOLUME] On Voice keypads, used in conjunction with the FUNCTION and desired volume control keys ↑ [3] or ↓ [6] to adjust the volume of a recorded message or voice system status.

4. [3 STAY] Arms perimeter portion of burglary system only. Interior protection is not armed, allowing movement within premises without causing an alarm. If pressed twice in succession, arms system in Night-Stay mode.

   [PLAY] On Voice keypads, used in conjunction with the FUNCTION and VOICE keys to play the recorded message.

   [↑] On Voice keypads, used in conjunction with the FUNCTION and VOLUME keys to raise the message and voice system status volume.

5. [4 MAX] Arms the entire burglary system, perimeter and interior, but without entry delay feature. Entering via an entry/exit door will cause an alarm.

6. [5 TEST] Tests the system and alarm sounder if disarmed. Refer to *Testing The System* section for test procedures.

7. [6 BYPASS] Removes individual protection zones from being monitored by the system.

   [↓] On Voice keypads, used in conjunction with the FUNCTION and VOLUME keys to lower the message and voice system status volume.

8. [7 INSTANT] Arms in manner similar to the STAY mode, but without the entry delay feature.

   Entering via an entry/exit door will cause an alarm.

9. [8 CODE] Used to assign additional security codes and attributes for other users of the system.

10. [9 CHIME] Turns CHIME mode on and off. When on, the opening of windows or doors while the system is disarmed will sound 3 beeps at the keypad(s).

Functions of the Keypads (cont'd)

11. [#] This key can be used for "Quick Arming" of the system without use of a security code (if programmed).

    [FUNCTION] On Voice keypads, enables the desired voice or volume function.

12. [0]

    [VOICE] On Voice keypads, enables the RECORD, VOLUME and PLAY functions.

13. [* READY] Used to display all open protection zones.

    [STATUS] On Voice keypads, a momentary press of the STATUS key annunciates the current system status. Pressing the STATUS key a second time annunciates and displays system and/or zone faults (if they exist).

14. **KEYS 0–9:** Used to enter your security code(s).

15. **MIC**
    On voice keypads, microphone for Message Center recordings.

16. **MESSAGE LED INDICATOR:** (RED)
    On Voice keypads, flashes red when message waiting or lights red (steady) when in record mode.

17. **READY LED INDICATOR:** (GREEN)
    Lit when the system is ready to be armed (no faults present). While the system is disarmed, this indicator will go on and off as protection zones are closed and opened.

18. **ARMED LED INDICATOR:** (RED)
    Lit when the system has been armed.

19. **FUNCTION KEYS:** Keys A, B, C, D may have been programmed for a variety of functions, including panic (emergency) functions. For details, see the *Function Keys* section.

20. **INTERNAL SPEAKER:** The built-in speaker mimics the alarm sounder during alarms, and will also "beep" during certain system functions. The speaker also provides voice playback for any recorded messages.

Entry/Exit Delays

Entry Delay

Entry Delays give you time to disarm the system when you re-enter through the designated entrance door. There are two entry delays (if programmed). The first is for your primary entrance and the second can be used for a secondary entrance, where a longer delay is required to walk to the keypad to disarm the system.

You must disarm the system before the entry delay period ends, or an alarm will occur. The keypad beeps during the entry delay period, reminding you to disarm the system. The beeps stop when a code is entered, but will restart after about 15 seconds if an invalid code is entered.

You can also arm the system with no entry delay at all by using the INSTANT or MAXIMUM arming modes. These modes provide greater security while on the premises or while away for extended periods of time.

See your installer for your delay times.

Partition 1_____

Exit Delay: ☐ seconds Entry Delay 1: ☐ seconds

Entry Delay 2: ☐ seconds

NOTE: Entry/Exit times set for partition 1 also apply to the Common Zone of the VISTA-20P Series.

Partition 2 (on VISTA-20P Series only)_____

Exit Delay: ☐ seconds Entry Delay 1: ☐ seconds

Entry Delay 2: ☐ seconds

Exit Delay

Exit delay gives you time to leave through the designated exit door(s) without setting off an alarm. Exit delay begins immediately after arming your system in any arming mode and Alpha Display keypads display the message "You May Exit Now." When "You may exit now" disappears, the system is fully armed. If programmed, a slow beeping will sound during the exit delay period until the last 10 seconds, which then changes to fast beeping (alerting you to the end of exit delay). If you cannot leave within this delay time period, you should stop, disarm the system, and start over to avoid a false alarm.

Exit Delay Restart (if programmed):If you wish to open the entry/exit door to let someone in after arming STAY, you can restart the *exit* time delay at any time - **simply press the [✱] key**, then let that person in. The system automatically rearms when the exit delay expires, thereby avoiding having to disarm the system and then rearm it again.

Additionally, when the system is armed AWAY, reopening and closing the entry/exit door **before** exit delay time expires (e.g., re-entering to get a forgotten item), will reset the exit delay time once.

Entry/Exit Delays (cont'd)

Exit Alarms

Exit Error Conditions

Whenever you arm the system, the exit delay begins. If an entry/exit door or interior zone is faulted before exit delay expires and remains faulted (e.g., exit door left open), the system sounds an alarm and starts the **entry** delay timer. If you disarm the system before the entry delay ends, the alarm sound stops and the message "ALARM CANCELED " or "CA" is displayed on the keypad, along with a zone number indicating the faulted zone. No message is sent to the Central Monitoring Station.

To clear the exit error condition, the open zone must be made intact; to clear the display, enter your code plus OFF.

If you do not disarm the system before the entry delay ends and the faulted zone remains open, the alarm sound continues and an "exit alarm" message is sent to the Central Monitoring Station (after the installer-programmed dial delay expires). The message "EXIT ALARM" or "EA" is displayed on the keypad, along with a zone number indicating the faulted zone. To stop the alarm, the system must be disarmed (your code plus OFF); to clear the display, enter your code plus OFF a second time.

An "exit alarm" also results if an entry/exit door or interior zone is faulted within two minutes after the end of the exit delay.

Your system may have been programmed for this feature to minimize false alarms sent to the Central Monitoring Station. Ask your installer if "Exit Alarm" is active in your system. If so, check this box. ☐

VISTA-20PSIA/VISTA-15PSIA: The Exit Error condition works the same as described above, except that in addition to the "EXIT ALARM" message, a "zone alarm" message is also sent to the Central Monitoring Station. In addition, if an entry/exit door or interior zone is faulted within two minutes after the end of the exit delay, a "Recent Closing" condition occurs instead of the "exit alarm." Refer to the next paragraph for details.

"Recent Closing" Condition (VISTA-20PSIA/VISTA-15PSIA only)

A Recent Closing condition is similar to the Exit Error condition described above, but occurs if an entry/exit door or interior zone is faulted within two minutes **after** the initial exit delay expires. If you disarm the system within the two minutes, the alarm sound stops and the message "ALARM CANCELED " or "CA" is displayed on the keypad, along with a zone number indicating the faulted zone. No message is sent to the Central Monitoring Station.

If you do not disarm the system within two minutes and the faulted zone remains open, the alarm sound continues and a "recent closing" and a "zone alarm" message are sent to the Central Monitoring Station (after the installer-programmed dial delay expires). The alarm message along with a faulted zone number is displayed on the keypad. To stop the alarm, the system must be disarmed (your code plus OFF); to clear the display, enter your code plus OFF a second time.

Checking For Open Zones

Using the [*] Key to Display and Announce System Status

Before arming your system, all protected doors, windows and other protection zones must be closed or bypassed; otherwise the keypad will display a "Not Ready" message.

Use the READY key to display all faulted zones, making it easier for you to identify and secure any open zone.

1. Press [*] (do not enter code first) to display faulted zones.
2. Secure or bypass the zones displayed.
   The keypad's READY indicator lights when all protection zones have been either closed or bypassed.
3. Arm the system as desired.

Alpha Display:

DISARMED
HIT * FOR FAULTS

Fixed-Word Display:
Zone no. and "NOT READY"

Voice Status: Voice keypads (if installed), can announce system status and faulted zones (up to 3 zone descriptors) if the Voice Status feature is turned on.

To turn the Voice Status feature on/off: [#] + [0] + [2] + [4]
(also turns on Voice Chime mode; see *Chime mode* section)

To announce Status: Press [#] FUNCTION + [0] VOICE + [*] STATUS key. (Announces current system status; e.g., "Disarmed Ready to Arm.")

To announce faults and status: Press [#] FUNCTION + [0] VOICE + [*] STATUS + [*] again. (Announces up to three faulted zones with their zone descriptors, if programmed.)

Arming the System

STAY Mode: Arms Perimeter Only, Entry Delay On

- Used when you want to arm the system with persons staying inside (or if you have pets that are moving throughout the premises).
- The perimeter sensors are armed, but interior sensors are left disarmed.
- Exit delay begins (you can leave through the entry/exit door, if desired).
- An alarm sounds if any protected window or non-entry/exit door is opened.
- You may otherwise move freely within the premises.
- Persons entering later can enter through an entry/exit door, but they must disarm the system within the *entry* delay period to avoid sounding an alarm.

NIGHT-STAY Mode: Arms Perimeter Only, Plus Selected Zones

- Use NIGHT-STAY mode to provide increased security while staying inside.
- Arms same as STAY mode, but also arms preselected interior sensors (programmed by your installer), while other interior sensors are left disarmed.
- Persons entering later can enter through an entry/exit door but they must disarm the system **and** must not violate any of the programmed interior zones to avoid sounding an alarm.
- **IMPORTANT:** When NIGHT-STAY mode is on, the selected interior zones are armed and cause an alarm if anyone enters those areas (e.g., waking in the middle of the night). To avoid sounding an alarm, you must disarm the system before any activity takes place in those interior zones.

INSTANT Mode: Arms Perimeter Only, Entry Delay Off

- Used when staying inside and do not expect anyone to use an entry/exit door.
- Arms same as STAY mode.
- An alarm sounds immediately if any protected perimeter window or any door is opened, including entry/exit doors.
- **IMPORTANT:** Arming the system in this mode greatly increases the chance of false alarms. Use extreme care in selecting this mode of arming.

AWAY Mode: Arms Entire System, Entry Delay On

- Used when nobody will be staying inside (including pets).
- The entire system (interior and perimeter) is armed.
- Exit delay begins letting you leave through the entry/exit door.
- An alarm sounds if a protected window or any door is opened, or if any movement is detected inside your premises.
- You can re-enter through an entry/exit door, but you must disarm the system within the *entry* delay period to avoid sounding an alarm.

MAXIMUM Mode: Arms Entire System, Entry Delay Off

- Used when leaving the premises for extended periods (e.g., vacation).
- Arms same as Away mode, but entry delay is off.
- An alarm sounds same as Away mode, and sounds upon opening entry/exit doors

Arming the System (cont'd)

Arming Commands

Before arming, close all perimeter doors and windows and make sure the Ready to Arm message is displayed.

Mode	Press these keys...	Keypad Confirms By...
STAY	security code + [3 STAY]	• three beeps • armed STAY message displayed • red ARMED indicator lights
NIGHT-STAY	security code + [3 STAY] + [3 STAY]	• three beeps • NIGHT-STAY message displayed • red ARMED indicator lights
INSTANT	security code + [7 INSTANT]	• three beeps • armed STAY message displayed • red ARMED indicator lights Note that entry delay is turned off.
AWAY	security code + [2 AWAY]	two beeps[1], or, if programmed, beeping for duration of exit delay • armed AWAY message displayed • red ARMED indicator lights Leave the premises through an entry/exit door during the exit delay period to avoid causing an alarm. The keypad beeps rapidly during the last 10 seconds of the exit delay to warn you that it is ending.
MAXIMUM	security code + [4 MAX]	• same as AWAY (described above) Note that entry delay is turned off.

[1] **Arming Ding**: In addition to the keypad beeps, the external sounder emits a short "ding" sound after arming, if programmed to do so. The ding confirms that the system is armed, and may occur immediately after the command or be delayed (until arm/disarm report is sent or exit delay expires). Ask your installer about how this feature is set for your system.

Quick Arming

If "Quick Arming" was programmed by the installer, the [#] key can be pressed in place of the security code when arming the system in any of the arming modes (except Night-Stay). **However, the security code must always be used when manually disarming the system.**

Function Key Arming

For any arming command, a function key may have also been programmed for your system. If so, you can press and hold the appropriate function key for 2 seconds to arm the system. See your installer for the designated functions (see ***Single Button Arming*** section).

Refer to the ***Accessing Other Partitions*** section for information on multi-partition arming (VISTA-20P Series only).

Arming the System (cont'd)

Single Button Arming

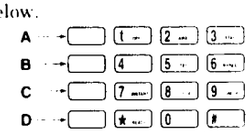
The "A", "B", "C", and/or "D" keys on your keypad may have been programmed for single-button arming. Note that while it is not necessary to use a security code for arming (by using the Quick Arm method described previously), a security code must always be used when manually disarming the system.

If Single-Button Arming is programmed:

- A function key has been assigned to a specific type of arming: STAY mode, NIGHT-STAY mode, AWAY mode, or STEP-ARMING (see Step-Arming paragraph).
- You DO NOT need to enter your user code before pressing the function key but you always need your user security code to DISARM the system.

Before arming, close all perimeter doors and windows.

1. Press and hold the assigned function key for 2 seconds (no code is required). Function keys are shown below.



Alpha Display:

```
DISARMED
READY TO ARM
```

Fixed-Word Display: Green LED lit

2. The keypad begins beeping and displays the armed message. The red ARMED indicator also lights.

Alpha Display:

```
ARMED***AWAY***
YOU MAY EXIT NOW
```

Fixed-Word Display: AWAY

Single Button "Step" Arming

Single-Button "Step" arming may be programmed into one of the lettered keys (A, B, C, or D). Check with your installer to see if this has been done in your system.

If Step-Arming is programmed:

- The assigned key provides a choice of three levels of security.
- The selected key can be pressed once, twice, or three times, increasing the level of security with each press, as follows:

Key	First Press	Second Press	Third Press
⇩	⇩	⇩	⇩
A, B, C, D	Armed-STAY	Armed NIGHT STAY (if programmed)	Armed-AWAY

Keyswitch

Using the Keyswitch

Your system may be equipped with a keyswitch for use when arming and disarming. Red and green lights on the keyswitch plate indicate the status of your system as follows:

Green Light: Lights when the system is **disarmed and ready** to be armed (no open zones). If the system is disarmed and the green light is off, it indicates the system is not ready (one or more zones are open).

Red Light: Lights or flashes when system is armed in AWAY or STAY mode. See your installer for the meanings of the lit red light:

Lit Steady = system armed AWAY or
system armed STAY and exit delay has expired

Flashing = system armed STAY and exit delay timer active

Rapid flashing = an alarm has occurred (memory of alarm).

Before arming, close all perimeter doors and windows.

To arm in the AWAY mode:

Turn the key to the right for 1/2 second and release. Keypads beep twice and the red indicator lights or flashes.

To arm in the STAY mode:

Turn the key to the right and hold for longer than 1 second, then release. Keypads beep three times and the red indicator lights or flashes.

To disarm the system:

Turn the key to the right and release. The red light turns off

Disarming and Silencing Alarms

Using the [OFF] key

The **OFF** key is used to disarm the system, silence alarm and trouble sounds, and clear alarm memories.

IMPORTANT: If you return and the main burglary sounder is on, DO NOT ENTER, but CONTACT THE POLICE from a nearby safe location.
If you return after an alarm has occurred and the main sounder has shut itself off, **the keypad will beep rapidly upon your entering, indicating that an alarm has occurred during your absence.**
LEAVE AT ONCE, and CONTACT THE POLICE from a nearby safe location.

1. ☐☐☐☐ + [1 OFF]
(Security Code)
The "READY" indicator light will be lit if all zones are secure, and the keypad will emit a single tone to confirm that the system is disarmed.

Alpha Display:

```
****DISARMED ****
READY TO ARM
```

Fixed-Word Display: READY

NOTE: If entry delay has started (you've opened the entry door), you do **not** need to press the OFF key – simply enter your security code. The system will disarm in about 15 seconds after the last digit of the code is entered.

2. **To Silence a Burglary Alarm and Clear a Memory of Alarm**
Enter your **security code** and press the **OFF** key to silence the alarm (or warning tones of a Memory of Alarm).
Note the zone in alarm on the keypad display, and correct the problem (close door, window, etc.). After correcting the problem, enter the security code plus OFF sequence *again* to clear the keypad's Memory of Alarm display.

3. **To Silence a Fire Alarm and Clear a Memory of Alarm**
Simply press the **OFF** key to silence the alarm. Then enter the **security code** plus **OFF** sequence *twice* to clear the keypad's Memory of Alarm display. See the *Fire Alarm System* section.

Bypassing Protection Zones

Using the BYPASS Key

Use this key when you want to arm your system with one or more zones intentionally unprotected. The system must be disarmed first.

Vent Zones: Your system may have certain windows set as "vent" zones, which are automatically bypassed if left open when arming the system (you do not need to manually bypass them). However, if a vent zone window is closed **after** arming, it becomes protected and will cause an alarm if opened again while the system is armed.

When bypassing zones:

- The system must be disarmed before you can bypass zones.
- Bypassed zones are unprotected and will not cause an alarm if violated.
- The system will not allow fire zones to be bypassed.
- Zones are automatically unbypassed when the system is disarmed.

1. ☐☐☐☐ + [6 BYPASS] + zone numbers (see below)
   (Security Code)
   Enter the 2-digit zone number(s) for the zone(s) to be bypassed (e.g., 06, 10, 13, etc.). Single digit zone numbers must be preceded by a zero (e.g. 05, 06).

2. When finished, the keypad will momentarily display a "Bypass" message for each bypassed zone number. Wait for all bypassed zones to be displayed.
   Arm the system as usual. When armed, the arming message is displayed with "ZONE BYPASSED."
   To display bypassed zones **prior** to arming, enter your security code and press the [6] BYPASS key.

Alpha Display:

```
DISARMED
HIT * FOR FAULTS
```

Fixed-Word Display: NOT READY

Alpha Display:

```
DISARMED BYPASS
READY TO ARM
```

Fixed-Word Display: BYPASS

Alpha Display:

```
ARMED: STAY
ZONE BYPASSED
```

Typical armed display after bypassing zones.

Bypassing Protection Zones (cont'd)

Quick Bypass

If programmed, "Quick Bypass" allows you to easily bypass all open (faulted) zones without having to enter zone numbers individually. This feature is useful if, for example, you routinely leave certain windows open when arming at night.

1. ☐☐☐☐ + [6 BYPASS] + [#]
   (Security Code)
   In a few moments, all open zones will be displayed and automatically bypassed. Make sure that only those zones that you wish to leave **unprotected** are bypassed, and that there are no other zones unintentionally left open.

2. Wait for all bypassed zones to be displayed, then arm the system as desired.

   Ask your installer if "Quick Bypass" is active for your system, and if so, check here: ☐

Alpha Display:

```
DISARMED
HIT * FOR FAULTS
```

Fixed-Word Display: NOT READY

Alpha Display:

```
DISARMED BYPASS
READY TO ARM
```

Fixed-Word Display: BYPASS

Chime Mode

Using the Chime Mode

CHIME mode alerts you to the opening of a perimeter door or window while the system is disarmed.

When Chime mode is activated:

- Three tones sound at the keypad whenever a perimeter door or window is opened.
- Interior zones do not produce a tone when they are faulted.
- Pressing the **READY** key will display the open protection points.
- Chime mode can be used only while the system is disarmed.

To turn Chime Mode on:

☐☐☐☐ + [9 CHIME]

(Security Code)

The CHIME message will appear. Perimeter zones will cause a tone when faulted.

Alpha Display:

```
DISARMED CHIME
READY TO ARM
```

Fixed-Word Display: CHIME

To turn Chime Mode off:

☐☐☐☐ + [9 CHIME]

(Security Code)

The CHIME message will disappear.

Alpha Display:

```
****DISARMED****
READY TO ARM
```

Fixed-Word Display: READY

Using the Voice Chime

Voice keypads have a feature that works in concert with the Chime Mode called Voice Chime. Voice chime provides a voice status annunciation, chime, and display when any faulted entry/exit or perimeter zone exists. Ask your installer if this option has been enabled for your system.

To turn Voice Chime Mode on or off: [#] + [0] + [2] + [4]

(normal Chime mode must be on first)

When Voice Chime is on, faulted zones cause a voice status announcement, chime and display. When off, the sounder still provides chime if normal Chime mode is on.

Date and Time

Viewing the Current Date and Time

The master users can view the system time and date setting on an alpha keypad. Other users can view the date/time if a function key has been programmed to do so.

☐☐☐☐ + [#] + [6] [3]

(Master Code)

OR,

Press the function key (A, B, C, or D) for viewing current date and time, if programmed.

Alpha Display:

```
****DISARMED
READY TO ARM
```

A typical time/date display is shown.

The display will remain on for about 30 seconds or until a key is pressed.

```
TIME/DATE     SAT
12:05AM 05/09/00
```

"A" "B" "C" "D"

☐ ☐ ☐ ☐

If one of the above keys has been programmed for the date/time display feature, place a check mark in the box beneath that key.

Setting the Date and Time

NOTE: All partitions must be disarmed before date/time can be set.

You can set the time and date by doing the following:

1. ☐☐☐☐ + [#] + [6] [3]

   (Master Code)

   Alpha Display:

   ```
   ****DISARMED
   READY TO ARM
   ```

2. Press [*] when the time/date is displayed.

   A cursor appears under the first digit of the hour.

   To move cursor ahead, press [*]. To go back, press [#].

   - Enter the 2-digit hour setting.
   - Enter the 2-digit minute setting.
   - Press [1] for PM or [0] for AM.
   - Enter the last two digits of the current year.
   - Enter the 2-digit month setting.
   - Enter the 2-digit day setting.

   ```
   TIME/DATE     SAT
   04:04PM 10/17/00
   ```

   Current time display

   ```
   TIME/DATE     SAT
   04:04P2000/10/17
   ```

   Time/date editing display

3. To exit, press [*] when cursor is at the last digit, or wait 30 seconds.

Panic Keys

Using Panic Keys

Your system may have been programmed to use special keys to manually activate emergency (panic) functions as follows:

This Function	Sends This Signal*	With This Sounding...
Silent Alarm	silent alarm	no audible alarm; displays, "Press [*] to show faults," indicating that a silent alarm has been initiated.
Audible Alarm	audible alarm	a loud, steady alarm at keypad(s) and at any external sounders that may be connected.
Personal Alarm	auxiliary alarm	steady alarm sound at keypad(s), but not at external bells or sirens.
Fire Alarm	fire alarm	temporal (pulsing) sound at external bells and sirens.

*All panic functions send signals to the Central Monitoring Station, if connected.

To activate a Panic Function:

Press and hold down for at least 2 seconds whichever lettered key on the keypad has been programmed for the desired emergency function.

OR

Press both keys of the assigned key pair at the same time.

Normal Alpha Display:

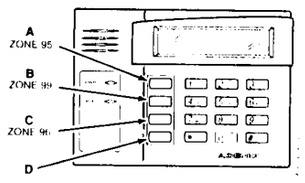
```
****DISARMED****
READY TO ARM
```

Fixed-Word Display: READY

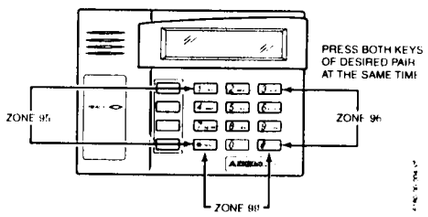
Typical Panic Alpha Display:

```
ALARM 96  ZONE 96
```

Fixed-Word Display: 96 and ALARM



Lettered Panic Keys



Panic Key Pairs

See your installer and use the chart provided in the ***Features Programmed in Your System*** section to note the functions that have been programmed for your system.

Macro Key Programming & Usage

About Macro Keys

The "A", "B", "C" or "D" keys can be used to automatically activate a series of commands of up to 16 keystrokes, if programmed for this function. These keystrokes, as a group, are called "macros" and are stored in the system's memory.

- Typical macro functions can include:
  - Arming sequences: STAY, NIGHT-STAY, INSTANT, or AWAY
  - Bypassing particular zone(s)
  - Activating relay(s) for turning on (or off) lights, fans, etc.
- Up to four (VISTA-20P Series) or two (VISTA-15P Series) macros can be assigned – but no more than one macro to a key.
- Macros can be activated only by users with authority levels authorized to perform the macro's function.

NOTE: The installer must activate the desired function key (using *57 Function key Menu Mode) before macros can be assigned.

See the chart at the back of this manual for the key(s) assigned for macros.

1. ☐☐☐☐ + [#] + [6] + [6]
   (Master Code)

Alpha Display:

```
****DISARMED****
READY TO ARM
```

2. Enter the macro number (1-4 for VISTA-20P Series; 1-2 for VISTA-15P Series) to be programmed at the "Select Macro?" prompt. Remember, only one macro can be assigned to each key.

```
SELECT MACRO
1-4              0
```

3. If a macro has been previously defined, the keystrokes are shown on the bottom line of the display; otherwise the display is blank.
   To exit this mode (and keep the existing macro definition), press any key except the [*] key. The system returns to normal mode.
   To define a macro for the selected key, press [*] and continue with the next prompt.

```
MACRO DISPLAY
```

   Enter the first of the series of desired commands, (do not include your master code), then press/hold the "D" key for at least two seconds to complete the first command. This key terminates each command, and appears as an "F" in the keypad display.

```
MACRO PGM
```

Macro Key Programming & Usage (cont'd)

The keypad beeps to acknowledge your input and displays the command you entered (followed by "F").

4. Enter the next command, followed by press/holding the "D" key for at least two seconds. The keypad beeps and displays the keystrokes entered so far.
5. Repeat until the all the desired commands (up to 16 characters including the "F"s) have been entered.

   Be sure to check your keystrokes before continuing. If you made a mistake, you must start over.

6. To exit, press/hold the "D" key for at least two seconds. The display returns to system status and indicates system is ready.

Example of Macro Programming

Suppose you want to (1) bypass the two upstairs window zones, then (2) turn on an exterior light, and then (3) arm the security system in the AWAY mode. The procedures in the table that follows show you how you would program this macro:

Typical Macro Alpha Display:

```
MACRO PGM
60203F#701F2F
```

Function	Keystrokes Required	Keypad Display
1. Bypass zones 02 & 03	Press BYPASS [6] key, then 2-digit zone numbers 02 & 03.	60203
2. Insert terminator	Press the "D" key for at least 2 seconds.	60203F
3. Turn light on (device 01)	Press [#] and 7 key for "device ON", and [01] key for selecting device 1.	60203F#701
4. Insert terminator	Press the "D" key for at least 2 seconds.	60203F#701F
5. Arm system AWAY	Press AWAY [2] key.	60203F#701F2
6. Insert terminator	Press the "D" key for at least 2 seconds.	60203F#701F2F

Using a Programmed Macro Key

```
****DISARMED****
READY TO ARM
```

1. Press the Macro key programmed for the desired series of commands for at least 2 seconds. The "Enter User Code" prompt appears. The prompt remains displayed for up to 30 seconds.

```
ENTER USER CODE
* * * *
```

2. Enter your 4-digit security code.

   The programmed macro sequence begins automatically after the user code is entered.

Using Device Commands

About Device Commands

Your system may be set up so that it can control certain lights or other devices.

- Some devices may be automatically turned on or off by the system.
- You may be able to override automatically controlled devices using the commands described below.
- Some devices can be manually turned on or off using the commands described below.
- See your installer for a list of devices that may be set up for your system. A list of these devices is provided at the back of this manual for you to fill out.

To Activate Devices:

☐☐☐☐ + [#] + [7] + 2-digit device number

(Security Code)

Devices associated with that device number activate.

Alpha Display:

```
****DISARMED****
READY TO ARM
```

Fixed-Word Display: READY

To Deactivate Devices:

☐☐☐☐ + [#] + [8] + 2-digit device number

(Security Code)

Devices associated with that device number deactivate.

Paging Feature

About Automatic Paging

Your system may be set up to automatically send messages to several pagers (4 pagers for VISTA-20P Series, 2 pagers for VISTA-15P Series) as certain conditions occur in your system.

- The following events can be programmed by your installer to be sent to the pagers: arming and disarming, alarms, and trouble conditions. (* reports when arming/disarming from a keypad using a security code; auto-arming/disarming, arming with assigned button, and keyswitch arming do not send pager messages.)
- You can also program the system to send an automatic pager message to alert you in the event that someone has not arrived home (disarmed the system) within a defined period of time (see the ***Scheduling*** section for details on programming a "latch key report").
- Your installer programs the pager phone numbers and reporting events.
- The pager message consists of a 7-digit system status code that indicates the type of condition that has occurred.
- An optional, predefined 16-digit character string can precede the 7-digit system status code; these characters can consist of a PIN no., subscriber account no., or any additional data that you may wish to have sent to the pager.
- The pager display format is as follows:

Optional 16 digits ↓ *3 digit Event Code* ↓

AAAAAAAAAAAAAAAA - BBB - CCCC ← *1-digit Partition No. + 3-digit Zone No. or User No.*

A =	B =	C =
Optional 16 digits for Account numbers, PIN numbers, or any other data programmed by the installer, if required.	A 3 digit code that describes the event that has occurred in your system (see for event codes table below).	A 1 digit Partition number plus a 3-digit Zone or User number, depending on the type of event that has occurred, where: • alarms and troubles display zone number • arming/disarming (opens/closes) display user number

The 3 digit Event Codes (BBB) that can be displayed are:

911 =	811 =	101 =	102 =
Alarms.	**Troubles.**	**Open (system disarmed).**	**Close (system armed).**
The 4 digit number (CCCC) following the code is the partition no. and *zone no.* that caused the alarm.	The 4 digit number (CCCC) following the code is the partition no. and *zone no.* that caused the trouble.	The 4 digit number (CCCC) that follows this code is the partition no. and *user no.* that disarmed the system.	The 4-digit number (CCCC) that follows this code is the partition no. and *user no.* that armed the system.

Examples of typical 7 digit pager displays follow:

Ex. 1 [911-8000] Reporting of an alarm (911) caused by a fault on zone 4 in Partition 1 (1004).

Ex. 2 [102-2005] Reporting of a closing/system arming (102) by user 5 in Partition 2 (2005).

Paging Feature (cont'd)

About Manual Paging

Your system may be set up so you can manually send a message to up to four (VISTA-20P Series) or two (VISTA-15P Series) pagers.

- Your installer programs the paging function key and the pager phone numbers.
- Pressing the paging keys sends the message [999-9999] to the selected pager.
- This message could mean "call home", "call your office", or any other prearranged meaning.
- See the Paging chart at the back of this manual for details of the paging setup for your system.

1. Press and hold the programmed Paging Key for at least 2 seconds (wait for beep), then press the pager number (1-4)* representing the pager intended to receive the message.
2. The recipient, on seeing the 999-9999 message, will understand the prearranged meaning of this signal.

* *If no number is pressed, the message is sent to pager 1. Pagers 1-4 for VISTA-20P Series; 1-2 for VISTA-15P Series.*

Alpha Display:

```
****DISARMED****
READY TO ARM
```

Fixed-Word Display: READY

```
999-9999
```

Pager Display

Latch Key Paging

You can program a schedule that causes a pager report to be sent if the system is not DISARMED by the scheduled time (see ***Scheduling*** section, event "03"). For example, a working parent might want a message to be sent to a pager if their child did not arrive home from school and disarm the system by a certain time.

If programmed, the message that is sent is: [777-7777].

Security Codes & Authority Levels

About Security Codes

Your installer assigned a master code that is used to perform all system functions. In addition, other security codes can be assigned for use by other users (VISTA-20P Series provides 47 additional codes; VISTA-15P Series provides 31 additional codes).

- Only the System Master and Partition Master can assign security codes to users.
- Users are identified by 2-digit user numbers and are pre-assigned to either partition 1 or partition 2 (VISTA-20P Series).
- Only the System Master can change user partitions.
- In addition to a security code, each user is assigned various system attributes.
- Security codes can be used interchangeably within a partition when performing system functions (a system armed with one security code can be disarmed by a different security code), with the exception of the Guest and Arm Only codes described below.
- Security code programming involves these steps:
  1. Choose a user number from the set of users assigned to the partition in which the user will be operating, and assign a 4-digit security code.
  2. Assign an authority level to that user.
  3. Assign other attributes as necessary (see attributes on the next page).

NOTE: The factory settings are designed to meet most normal user situations. Therefore, the only step you usually need to do when adding users is assign a user number (from the partition's pre-assigned user numbers) and a security code.

Authority Level Definitions

Authority levels define the system functions a particular user can/cannot perform.

Level	Title	Explanation
N/A	System Master (default = 1234)	Reserved for user 02. Can perform all system functions and assign codes in both partitions; can change its own code as follows: Master code + [8] + 02 + new master code + new master code again
0	Standard User	Can only perform security functions in assigned partition. Cannot perform system functions reserved for the master user.
1	Arm Only	Can only arm the system. Cannot disarm or do other functions.
2	Guest	Can arm the system in assigned partitions, but cannot disarm the system **unless** the system was armed with this code. This code is typically assigned to someone (e.g., babysitter or cleaner) who has a need to arm/disarm the system only at certain times. The user of this code should **not** use the "Quick Arming" feature.
3	Duress Code	Intended for use when you are forced to disarm or arm the system under threat. When used, the system will act normally, but can silently notify the Central Monitoring Station of your situation, if that service has been provided.
4	Partition Master	(VISTA-20P Series) Can do everything a standard user can do, and can assign security codes to users in their partition.

Security Codes & Authority Levels (cont'd)

How to Assign Security Codes and User Attributes

The following lists the various command strings for adding security codes and attributes.

Refer to the User Setup chart at the back of this manual for factory defaults of user attributes and to keep a record of user programming.

NOTE: Partition Master codes (VISTA-20P Series only) apply only to those user numbers previously assigned (by the system master/installer) to the partition master's partition.

Add Security Code: System/Partition Master code + [8] + user no. + new user's security code

(Users 03/33 are preset to partition programmers, but can be changed.)

User 01 = installer
User 02 = master
User 03 = partition 1 master
User 33 = partition 2 master

The Keypad beeps once to confirm that new user was added.

Delete Security Code: System/Partition Master code + [8] + [user no.] + [#] [0]

The security code and all attributes* set for this user number, including any associated RF keys, are erased from the system. (*except assigned partition)

Authority Level: System/Partition Master code + [8] + [user no.] + [#] [1]+ auth. level

Factory Defaults:
users 04-32/34-49 = 0
users 03/33 = 4

Authority Levels (see definitions on previous page):
0 = standard user
1 = arm only
2 = guest
3 = duress
4 = partition master (VISTA-20P Series only)

Access Group: System/Partition Master Code + [8] + [user no.] + [#] [2]+ group (1-8)

Factory Defaults: none

You can assign users to a group, then set an access schedule that defines the times this group of users can operate the system. The system ignores these users outside the scheduled times.

User's Partition: System Master Code + [8] + [user no.] + [#] [3] + [0] + partition(s) + [#]

(VISTA-20P only)
Factory Defaults:
Part. 1 = users 03-32
Part. 2 = users 33-49

This command assigns the partitions the user can access. If more than one, enter partition numbers sequentially, then press [#] to end. E.g., master code + [8] + [user no.] + [#] [3] + [0] + [1] [2] + [#] gives the user access to partitions 1 and 2 and the common partition.

Partition Entries: 1 = partition 1 and common
2 = partition 2 and common
3 = common partition only

RF User Number: Master/Part. Prog. Code + [8] + [user no.] + [#] [4]+ zone no.

Factory Defaults: none

Use this command to assign a wireless button device (keyfob) to the user (keyfob must be enrolled in system first; see installer). Zone number: enter the zone number assigned to a button on the keyfob that will be used for arming/disarming by this user.

Pager On/Off: Master/Part. Prog. Code + [8] + [user no.] + [#] [5] + 0 or 1

Factory Defaults:
users 01-49 = 1 (on)

You can program a user so that a message is sent to a pager whenever this code is used to arm or disarm the system.
Pager On/Off: 1 = allow paging; 0 = no paging for this user.

Accessing Other Partitions (VISTA-20P)

About Accessing Partitions

(GOTO Command and Multi-Partition Arming)

Each keypad is assigned a default partition for display purposes, and will show only that partition's information.

- If the user is authorized, a keypad in one partition can be used to perform system functions in the other partition by using the **GOTO** command. Refer to the GOTO section.
- If the user is authorized, that user can arm other partitions. Refer to the Multi-Partition Arming section.

The following table shows the relationship of the keypads in each partition when system is armed and disarmed.

	PARTITION 1		PARTITION 2		COMMON ZONE (LOBBY, etc.)	
	Arming State	**Keypad Status**	**Arming State**	**Keypad Status**	**Arming State**	**Keypad Status**
Condition 1 ⇨	Disarmed	Partition 1 **Only**	Disarmed	Partition 2 **Only**	Disarmed	Common Zone **Only**
Condition 2 ⇨	Disarmed	Partition 1 and Common Zone	Armed	Partition 2 **Only**	Disarmed	Common Zone **Only**
Condition 3 ⇨	Armed	Partition 1 **Only**	Disarmed	Partition 2 and Common Zone	Disarmed	Common Zone **Only**
Condition 4 ⇨	Armed	Partition 1 **Only**	Armed	Partition 2 **Only**	Armed	Common Zone **Only**

When both partitions are disarmed, the keypad in each partition displays zone status for its partition only. The common zone keypad shows the status in that zone only. See Condition 1 above.

When partition 1 is disarmed and partition 2 is armed, the keypad in partition 1 shows the status of partition 1 **and** the common zone. Partition 2 will display the status of partition 2 **only.** See Condition 2 above.

When partition 1 is armed and partition 2 is disarmed, the keypad in partition 1 shows the status of partition 1 **only**. Partition 2 will display the status of partition 2 **and** the common zone. See Condition 3 above.

As long as any one of the two partitions is disarmed, the common zone will always be disarmed. The common zone will be armed only when both partition 1 and 2 are armed. See Condition 4 above.

Accessing Other Partitions (cont'd)

Using the GoTo Command (VISTA-20P)

If the user is authorized, a keypad in one partition can be used to perform system functions in the other partition by using the **GOTO** command.

- You must use an Alpha keypad to access another partition.
- Keypads automatically return to their original partition after 30 seconds with no keypad activity.

1. ☐☐☐☐ + [*] + partition number (0,1,2,3)
   (Security Code; only applies if user has access to other partitions)
   0 = return to keypad's original partition.
   1 = partition 1; 2 = partition 2; 3 = common zone
   The keypad beeps to confirm the partition change.

Alpha Display:

```
1 DISARMED
READY TO ARM
```

Fixed-Word Display: Green LED lit

2. The keypad remains in the new partition until directed to go to another partition, or until it automatically returns to the original partition.
   The active partition number is displayed in the upper left portion of screen, if the option is selected.

Alpha Display:

```
2 DISARMED
READY TO ARM
```

Fixed-Word Display: Green LED lit

Multi-Partition Arming (VISTA-20P)

Some users can be given Multi-Partition arming ability by being assigned to both partitions when programming user attributes.
When attempting to arm multi-partitions:

- You must use an Alpha keypad.
- The system arms only if all partitions are "ready to arm."
- If any partition is "not ready," the system does not arm at all.
- You can use the GOTO command to bypass open zones before arming.
- If any partition is already armed when global arming is attempted, that partition remains in its existing armed state.

☐☐☐☐ + [0] + arm command (see list below)
(Security Code)

Alpha Display:

```
1 DISARMED
READY TO ARM
```

Fixed-Word Display: Green LED lit

Multi-Partition Arming Commands

2 = arms all partitions AWAY
3 = arms all partitions STAY
33 = arms all partitions NIGHT-STAY
4 = arms all partitions MAXIMUM
7 = arms all partitions INSTANT
1 = disarms all partitions

Accessing Other Partitions *(cont'd)*

Common Zone Operation (VISTA-20P)

Ask your installer if a "common zone" was assigned. If so, check this box ☐

Your system may have been set up to use a common zone, which is an area shared by users of both partitions, such as a foyer or lobby. If so, please note the following:

- The common zone will sound and report alarms only when **both** partitions are armed. If only one partition is armed, the system ignores faults on the common zone.
- Either partition may arm its system if the common zone is faulted, but once armed, the other partition **will not** be able to arm unless the common zone is first bypassed or the fault is corrected.
- Faults on the common zone are displayed on common partition keypads, and will also appear on another partition's keypad when the alternate partition is armed.
- Either partition can clear and restore the common zone after an alarm.
- Entry/exit time for the common zone is the same as for partition 1.

Scheduling

About Scheduling

The system provides end-user schedules (programmable by master/installer only), which can control various types of events.

- Each schedule causes a defined event to start and stop (when appropriate) at a specified time.
- Schedules can be set to automatically repeat at various intervals.
- Schedules can be set for random starting, if desired.
- VISTA-20P Series provides up to 16 user schedules.
- VISTA-15P Series provides up to 4 user schedules.

Creating Schedules

Alpha Displays:

1. ☐☐☐☐ + [#] + [6] [4]
   (Master Code)

   ```
   1 DISARMED
   READY TO ARM
   ```

2. Enter a 2-digit schedule number from:
   01-16 (VISTA-20P Series) or 01-04 (VISTA-15P Series).
   Press [*] to continue.

   ```
   ENTER SCHED NO.
   00=QUIT      00
   ```

3. Enter the desired 2-digit event number from the list:
   00 = clear the scheduled event
   01 = turn a programmed output on or off
   (see ***Using Device Commands*** section for a list of output device numbers used in your system)
   02 = set a user access schedule for one or more users
   (see ***Security Codes*** section for an explanation of access groups)
   03 = send a "latch-key" report to a pager if the system is not disarmed by a specified time; message sent is "777-7777."
   04 = automatically arm the system in STAY mode at a specified time
   05 = automatically arm the system in AWAY mode at a specified time
   06 = automatically disarm the system at a specified time
   07 = Display the word "REMINDER" at a specified time (if selected, the keypad beeps every 30 seconds beginning when the word "REMINDER" is first displayed, and the display alternates with the normal keypad display about every 4-5 seconds. To stop the beeps and cancel the display once it starts, press any key).
   Press [*] to continue.

   ```
   ENTER EVENT
   CLEAR EVENT  00
   ```

4. For event number "01," enter the output number associated with this schedule.
   Otherwise, this prompt is skipped.
   Press [*] to continue to the "Start" prompt shown on the next page.

   ```
   RELAY NUMBER
                00
   ```

Scheduling (cont'd)

5. For event number "02," enter the access group number. Otherwise, this prompt is skipped.
   Press [*] to continue to the "Start" prompt below.

```
GROUP NUMBER
              X
```

6. For event numbers "03-07," enter the partition number to be armed or disarmed.
   0 = arm all; 1 = partition 1; 2 = partition 2; 3 = arm common
   Otherwise, this prompt is skipped.
   Press [*] to continue to the "Start" prompt.

```
PARTITION
              X
```

7. Enter the event's start time and days of week.
   Hour = 00-12; minute = 00-59
   AM = 0; PM = 1
   Days = Position the cursor under the desired days using the [*] key to move forward, then press "1" to select the day.
   Press [*] to continue.

```
START     SMTWTFS
HH:MMAM   1000000
```

8. If applicable, enter the event's stop time and days of week (applies only to event numbers 01, 02, and 03).
   Refer to step 7 for available entries.
   Press [*] to continue.

```
STOP      SMTWTFS
HH:MMAM   1000000
```

9. Enter the desired repeat option.
   0 = no repeat
   1 = repeat schedule weekly
   2 = repeat schedule biweekly (every other week)
   3 = repeat schedule every third week
   4 = repeat schedule every fourth week
   e.g., To make a schedule that happens everyday you would select all days with a repeat count of 1. To make a schedule that runs for one week then stops, select everyday with a repeat count of 0.

```
REPEAT OPTION
0-4           X
```

10. For event number 01 (output on/off), select the randomize option, if desired.
    0 = no; 1 = yes
    If selected, the schedule times will vary within 60 minutes of the "hour" time. For example, if a schedule is set to start at 6:15pm, it will do so the first time 6:15pm arrives, but on subsequent days it will start anytime between 6:00 and 6:59 p.m.
    Press [*] to continue.

```
RANDOMIZE
0/NO 1/YES    X
```


Event Logging Procedures

About Event Logging

The system records various events in a history log, which can be viewed by the master user on an Alpha Display keypad.

- The Event Log holds up to 100 (VISTA-20P Series) or 50 (VISTA-15P Series) events.
- Events are displayed in chronological order, from most recent to oldest.
- When the log is full, the oldest event is replaced by the logging of any new event.

Viewing the Event Log

1. ☐☐☐☐ + [#] + [6] + [0]
   (Master Code)

Alpha Displays:

```
****DISARMED****
READY TO ARM
```

2. The system displays the most recent event as follows:
   - event number
   - type of event, identified by its corresponding code (refer to the code table that follows)
   - zone or user number (depending on type of event)
   - partition in which event occurred
   - time and date of the event's occurrence.

```
001 E441 U001 P1
12:34AM 01/02/00
```

3. Pressing [*] displays previous events (back in time). Pressing [#] displays events forward in time.
4. Exit the event log by pressing any key other than [*] or [#].

Understanding the Type of Event Displayed

If the event code is preceded by an E (as in the above display), it means that the event is new and ongoing; if preceded by an R, it means the event has been restored

Code	Definition
110	Fire Alarm
121	Duress
122	Alarm, 24-hour Silent
123	Alarm, 24-hour Audible

Code	Definition
131	Alarm, Perimeter
132	Alarm, Interior
134	Alarm, Entry/Exit
135	Alarm, Day/Night

Event Logging Procedures (cont'd)

Code	Definition
143	Alarm, Expansion Module
145	ECP Module cover tamper
146	Silent Burglary
150	Alarm, 24-Hour Auxiliary/Monitor zone
162	Carbon Monoxide
301	AC Power
302	Low System Battery/Battery Test Fail
305	System Reset (Log only)
321	Bell/Siren Trouble
333	Trouble, Expansion Mod. Supervision
341	Trouble, ECP Cover Tamper
344	RF Receiver Jam
351	Telco Line Fault
353	Long Range Radio Trouble
373	Fire Loop Trouble
374	Exit Error Alarm
380	Global Trouble, Trouble Day/Night
381	RF Supervision Trouble
382	Supervision Auxiliary Wire Zone
383	RF Sensor Tamper
384	RF Sensor Low-battery
393	Clean Me

Code	Definition
401	Disarmed, Armed AWAY, Armed STAY
403	Schedule Arm/Disarm AWAY
406	Cancel by User
407	Remote Arm/Disarm (Downloading)
408	Quick Arm AWAY
409	Keyswitch Arm/Disarm AWAY
441	Disarmed/Armed STAY/INSTANT, Quick-Arm STAY/INSTANT
442	Keyswitch Arm/Disarm STAY
459	Recent Closing
570	Bypass
601	Manually Triggered Dialer Test
602	Periodic Test
606	AAV to Follow
607	Walk Test Entered/Exited
623	Event Log 80% Full
625	Real-Time Clock was Changed (log only)
627	Program Mode Entry (log only)
628	Program Mode Exit (log only)
642	Latch Key (log only)
750 -789	Reserved for Configurable Zone Type report codes (check with central station when using these codes)

NOTE: Ask your installer to explain the meaning of any code you do not understand.

Testing the System

About Testing the System

Using the Test mode allows each protection point to be checked for proper operation. ***Testing should be conducted weekly to ensure proper operation.***

- The keypad sounds a single beep about every 30 seconds as a reminder that the system is in the Test mode.
- Alarm messages are not sent to your Central Station while Test mode is on.

1. Disarm the system and close all protected windows, doors, etc. The READY indicator light should come on if all zones are intact (i.e., all protected windows, doors, etc. are closed.

   Alpha Displays:

   ```
   ****DISARMED****
   READY TO ARM
   ```

2. ☐☐☐☐ + [5 *TEST*] then [0] (walk)

   (Master Code)

   ```
   1 = DIAL, 0 = WALK
   ```

   The Dial test (option "1") is intended for the installer and should not be used unless directed to do so by your Security System Representative.

3. Listen. The external sounder should sound for about 1 second then turn off. If the sounder does not sound, CALL FOR SERVICE. The "Test in Progress" display appears only on the keypad that started the test.

   ```
   TEST IN PROGRESS
   ```

4. Fault zones. Open each protected door and window in turn and listen for three beeps from the keypad. Identification (zone number or zone description) of each faulted protection point should appear on the display. The display clears when the door or window is closed.
5. Walk in front of any interior motion detectors (if used) and listen for three beeps. The identification of the detector should appear on the display when it is activated. The display clears when no motion is detected. *Note that if wireless motion detectors are used, there is a 3-minute delay between activations. This conserves battery life.*
6. Test all smoke detectors, following the manufacturer's instructions. The identification of each detector should appear on the display when each is activated. If a problem is experienced with any protection point (no confirming sounds, no display), call for service immediately.

   When all protection points have been checked and are intact (closed), there should be no zone identification numbers displayed on the keypad.
7. Exit test mode: ☐☐☐☐ + [1 *OFF*]

   (Security Code)

   If the test mode is inadvertently left active, it automatically turns off after 4 hours. During the final five minutes, the keypad will emit a double beep every 30 seconds.

Trouble Conditions

"Check" and "Battery" Displays

The word **CHECK** on the keypad's display, accompanied by a "beeping" at the keypad, indicates a trouble condition in the system.

To silence the beeping for these conditions, press any key.

1. **A display of "CHECK" and one or more zone numbers** indicates that a problem exists with the displayed zone(s) and requires your attention. Determine if the zone(s) displayed are intact and make them so if they are not. If the problem has been corrected, the display can be cleared if you enter the OFF sequence (security code plus OFF key) **twice**. If the display persists, CALL FOR SERVICE.

   Note: A display of **CHECK 70** on Alpha Display keypads indicates that the wiring connection to the external sounder is at fault (opened or shorted), and you should CALL FOR SERVICE. See "BELL FAILURE" on next page. A display of **CHECK 90** indicates that RF interference may be impeding the operation of wireless sensors* in the system. See **"Rcvr Jam"** on next page.

2. **If there are wireless sensors* in your system,** the **CHECK** condition may also be caused by some change in the environment that prevents the wireless receiver from receiving messages from a particular sensor. CALL FOR SERVICE if this occurs.

   * Not all systems use wireless sensors.

IF YOU CANNOT CORRECT A "CHECK" DISPLAY, CALL FOR SERVICE.

TYPICAL "CHECK" DISPLAYS

FIXED-WORD DISPLAY KEYPAD

ALPHA DISPLAY KEYPAD

Trouble Conditions (cont'd)

Words or letters in parentheses ( ) are those that are displayed on Fixed-Word Display keypads.

Other Trouble Displays

* Any "beeping" that accompanies a trouble display can be stopped by depressing any key on the keypad or by entering an OFF sequence (code + OFF)

** Not all systems use wireless sensors.

COMM. FAILURE (or **FC**)	Indicates that a failure has occurred in the telephone communication portion of your system. CALL FOR SERVICE
SYSTEM LO BAT (or **BAT** with no zone No.)	Indicates that a low system battery condition exists. Display is accompanied by "beeping"* at the keypad. If this condition persists for more than one day (with AC present), CALL FOR SERVICE.
LO BAT + zone descriptor (or **BAT** with zone No.)	Indicates that there is a low battery condition in the wireless transmitter** number displayed (00 is RF keypad). Accompanied by a single "beep"* (about once every 30 seconds) at the keypad. Either replace the battery yourself, or CALL FOR SERVICE. If the battery is not replaced within 30 days, a **CHECK** display may occur.
Rcvr Jam (or **CHECK 90**)	Wireless part of the system is experiencing RF interference which may impede reception from wireless sensors.**
ALARM 1xx **FAULT 1xx** **CHECK 1xx** (or **91**)	Indicates a communication problem between the control and a connected device (e.g., RF receiver, zone expander) where the "xx" indicates the device address. CALL FOR SERVICE.
MODEM COMM (or **CC**)	Indicates that the control is on-line with the Central Monitoring Station's remote computer. The control will not report system activity while on-line. Wait a few minutes -- the display should disappear.
BELL FAILURE (or **CHECK 70**)	Indicates that the wiring connection to the external sounder is at fault (open or shorted). Accompanied by "beeping" at the keypad. CALL FOR SERVICE.

Trouble Conditions (cont'd)

Other Trouble Displays (Continued)

AC LOSS (or **NO AC**)	The system is operating on battery power only due to an AC power failure. If only some lights are out on the premises, check circuit breakers and fuses and reset or replace as necessary. If AC power cannot be restored and a "low system battery" message appears (see previous page), **CALL FOR SERVICE**.
Busy-Standby (or **dI**)	If this message remains displayed for more than 1 minute, system is disabled. **CALL FOR SERVICE**.
OPEN CIRCUIT (or **OC**)	The keypad is not receiving signals from the control. CALL FOR SERVICE.
Long Rng Trbl (or **bF**)	If part of your system, back-up Long Range Radio communication has failed. CALL FOR SERVICE.
TELCO FAULT (or **CHECK 94**)	The telephone line has a problem. CALL FOR SERVICE.

Total Power Failure If there is no keypad display at all, and the READY indicator is not lit, operating power (from AC and back-up battery) for the system has been interrupted and the system is inoperative. **CALL FOR SERVICE.**

In The Event Of Telephone Operational Problems

In the event of telephone operational problems, disconnect the control from the phone line by removing the plug from the phone wall jack. We recommend that your installer demonstrate this disconnection on installation of the system. Do not attempt to disconnect the phone connection inside the control. Doing so will result in the loss of your phone lines. If the regular phones work correctly after the control has been disconnected from the phone wall jack, the control has a problem and you should immediately call for service. If upon disconnection of the control, there is still a problem on the phone line, notify the Telephone Company that they have a problem and request prompt phone repair service. The user may not under any circumstances attempt any service or repairs to the security system. Repairs must be made only by authorized service (see the LIMITED WARRANTY statement for information on how to obtain service).

Maintaining Your System

Taking Care of Your System The components of your security system are designed to be as maintenance-free as possible. However, to make sure that your system is in reliable working condition, do the following:
1. Test your system weekly.
2. Test your system after any alarm occurs.

Silencing Low Battery Warning Tones at the Keypad You can silence the keypad's warning tones by pressing the OFF key, but the keypad's low battery message display will remain on as a reminder that you have a low battery condition in one or more of your wireless sensors. When you replace the weak battery with a fresh one, the sensor sends a "good battery" signal to the control as soon as the sensor is activated (opening/closing of door, window, etc.), causing the low battery display to turn off. If the sensor is not activated, the display will automatically clear within approximately 1 hour.

Replacing Batteries in Wireless Sensors Each wireless sensor in your system has a 9-volt or 3-volt battery. The system detects a low battery in wireless sensors, including smoke detectors, the personal emergency transmitter, and the portable wireless keypad and displays a low battery message*. (A low battery in a portable wireless keypad is detected as soon as one of its keys is pressed, and displayed as **00**.). Battery-operated smoke detectors with a low battery also emit a single "chirp" sound approximately once every 20–30 seconds.

Wireless sensors may not have been used in your security system

IMPORTANT: Use only batteries recommended by your installer as replacement

Alkaline batteries provide a minimum of 1 year of operation, and in most units and applications, provide 2–4 years of service. 3-volt lithium batteries provide up to 4 or more years of operation. Actual battery life will depend on the environment in which the sensor is used, the number of signals that the transmitter in the sensor has had to send, and the specific type of sensor. Factors such as humidity, high or low temperatures or large swings in temperature, may all lead to the reduction of actual battery life in an installation.

* The low battery message comes on as a warning that battery replacement in indicated sensor(s) is due within 30 days. In the meantime, a sensor causing a low battery indication is still fully operational.

Routine Care
- Treat the components of your security system as you would any other electrical equipment. Do not slam sensor-protected doors or windows.
- Keep dust from accumulating on the keypad and all protective sensors, particularly on motion sensors and smoke detectors.
- The keypad and sensors should be cleaned carefully with a dry soft cloth. **Do not spray water or any other fluid on the units.**

Fire Alarm System

THIS SECTION APPLIES ONLY TO RESIDENTIAL SYSTEMS

General

Your fire alarm system (if installed) is on 24 hours a day, for continuous protection. In the event of an emergency, the strategically located smoke and heat detectors will sound their alarms and automatically send signals to your system, triggering a loud, interrupted pulsed sound* from the Keypad(s) and any external sounders. A FIRE message will appear at your Keypad and remain on until you silence the alarm (see below for silencing fire alarms).

*Temporal pulse sounding is produced for Fire alarms, as follows:

3 pulses–pause–3 pulses–pause–3 pulses–pause. . . , repeated.

TYPICAL FIRE EMERGENCY DISPLAYS

ALPHA DISPLAY KEYPAD

FIXED-WORD DISPLAY KEYPAD

Silencing Fire Alarms and Clearing Memory of Alarm

1. You can silence the alarm at any time by pressing the **OFF** key (the security code is not needed to silence fire alarms). To clear the display, enter your code and press the **OFF** key again (to clear Memory of Alarm).
2. If the Keypad's FIRE display does not clear after the second OFF sequence, smoke detectors may still be responding to smoke or heat producing objects in their vicinity. Investigate, and should this be the case, eliminate the source of heat or smoke.
3. If this does not remedy the problem, there may still be smoke in the detector. Clear it by fanning the detector for about 30 seconds. When the problem has been corrected, clear the display by entering your code and pressing the **OFF** key.

Smoke Detector Reset

Depending on the type of smoke detectors in your system, it may be necessary to "reset" the smoke detectors after a fire alarm has been turned off. Check with your installer. This "reset" is accomplished at a keypad, as follows:

Enter security code (except "arm only" user), then press the [1] key.

NOTE: During smoke detector reset, "FAULT xx" appears (about six seconds) and should disappear if the detector is clear.

Fire Alarm System (cont'd)

THIS SECTION APPLIES ONLY TO RESIDENTIAL SYSTEMS

Manually Initiating a Fire Alarm

1. Should you become aware of a fire emergency before your smoke or heat detectors sense the problem, go to your nearest keypad and manually initiate an alarm by pressing the panic key assigned for FIRE emergency for 2 seconds (see below). If a key pair has been assigned for fire, press both keys at the same time. See the *Using the Panic Keys* section below for further details.
2. Evacuate all occupants from the premises.
3. If flames and/or smoke are present, leave the premises and notify your local Fire Department immediately.
4. If no flames or smoke are apparent, investigate the cause of the alarm. The zone number(s) of the zone(s) in an alarm condition will be displayed at the keypad.

Using the Panic Key(s) Assigned for FIRE Emergency

A key or key pair may have been assigned for manually initiating a FIRE alarm. See the *Panic Keys* section for key assignments.

For convenience, indicate the key or key pair assigned for fire below.

Individual Keys

A B C

☐ ☐ ☐ Press the individual key assigned for fire for 2 seconds

OR

Key Pairs

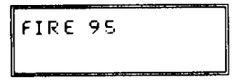
☐ [1 OFF] and [* READY] (zone 95)

☐ [* READY] and [#] (zone 99)

☐ [3 STAY] and [#] (zone 96)

Press both keys of the key pair assigned for fire at the same time

DISPLAYS FOLLOWING MANUAL INITIATION OF A FIRE ALARM



ALPHA DISPLAY KEYPAD

FIXED-WORD KEYPAD

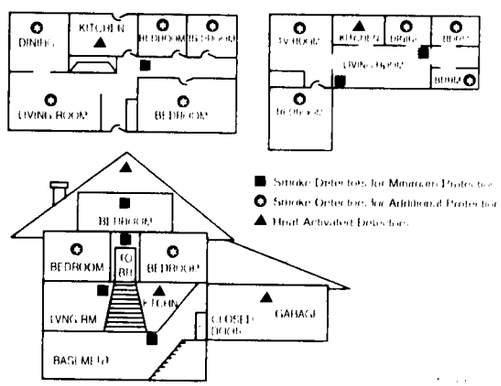
THIS SECTION APPLIES ONLY TO RESIDENTIAL SYSTEMS

National Fire Protection Association Recommendations on Smoke Detectors

With regard to the number and placement of smoke/heat detectors, we subscribe to the recommendations contained in the National Fire Protection Association's National Fire Alarm Code (NFPA 72) noted below.

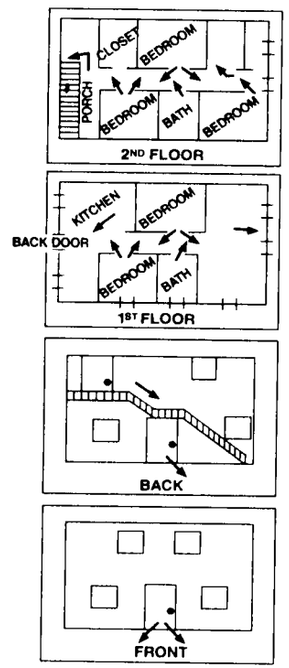
Early warning fire detection is best achieved by the installation of fire detection equipment in all rooms and areas of the household as follows: A smoke detector installed outside of each separate sleeping area, in the immediate vicinity of the bedrooms and on each additional story of the family living unit, including basements and excluding crawl spaces and unfinished attics.

In addition, the NFPA recommends that you install heat or smoke detectors in the living room, dining room, bedroom(s), kitchen, hallway(s), attic, furnace room, utility and storage rooms, basements and attached garages.



THIS SECTION APPLIES ONLY TO RESIDENTIAL SYSTEMS

Emergency Evacuation



Establish and regularly practice a plan of escape in the event of fire. The following steps are recommended by the National Fire Protection Association:

1. Position your detector or your interior and/or exterior sounders so that they can be heard by all occupants.
2. Determine two means of escape from each room. One path of escape should lead to the door that permits normal exit from the building. The other may be a window, should your path be impassable. Station an escape ladder at such windows if there is a long drop to the ground.
3. Sketch a floor plan of the building. Show windows, doors, stairs and rooftops that can be used to escape. Indicate escape routes for each room. Keep these routes free from obstruction and post copies of the escape routes in every room.
4. Assure that all bedroom doors are shut while you are asleep. This will prevent deadly smoke from entering while you escape.
5. Try the door. If the door is hot, check your alternate escape route. If the door is cool, open it cautiously. Be prepared to slam the door if smoke or heat rushes in.
6. When smoke is present, crawl on the ground. Do not walk upright, since smoke rises and may overcome you. Clearer air is near the floor.
7. Escape quickly; don't panic.
8. Establish a common meeting place outdoors, away from your house, where everyone can meet and then take steps to contact the authorities and account for those missing. Choose someone to assure that nobody returns to the house — many die going back.

Quick Guide to Basic System Functions

FUNCTION	PROCEDURE	COMMENTS
Check Zones	Press READY key.	View faulted zones when system not ready.
Arm System	Enter code. Press arming key desired. (AWAY, STAY, NIGHT-STAY, MAXIMUM, INSTANT)	Arms system in mode selected.
Quick Arm (if programmed)	Press #. Press arming key desired: (AWAY, STAY, MAXIMUM, INSTANT)	Arms system in mode selected, quickly and without use of a code.
Bypass Zone(s)	Enter code. Press BYPASS [6] key. Enter zone number(s) to be bypassed (use 2-digit entries).	Bypassed zones are unprotected and will not cause an alarm if violated.
Quick Bypass (if programmed)	Enter code. Press BYPASS [6] key + [#].	Bypasses all faulted zones automatically.
Silence Sounders **Burglary:** **Fire:** **"Check":**	Enter code. Press OFF [1] key. Press OFF [1] key. Press any key.	Also disarms system. Memory of alarm remains until cleared. Memory of Alarm remains until cleared. Determine cause.
Disarm System	Enter code. Press OFF [1] key. (OFF need not be pressed if entry delay or an alarm is active)	Also silences sounders. Memory of alarm remains until cleared.
Clear Alarm Memory	After disarming, enter code again. Press OFF [1] key again.	Keypad beeps rapidly on entry if alarm has occurred while absent. Alarm display will remain upon disarming until cleared.
Duress (if active and connected to Central Station)	Arm or disarm "normally," but use your 4-digit Duress code to do so.	Performs desired action and sends silent alarm to Central Station.
Panic Alarms (as programmed)	Press key [A], [B], or [C] for at least 2 seconds, or key pairs 1 + ✱, ✱ + #, or 3 + # respectively.	See the *Panic Keys* section for emergency functions programmed for your system. Note: Keys "A", "B", and "C" may have been programmed for other functions.
Chime Mode	*To turn ON or OFF:* Enter code. Press CHIME key.	The keypad will sound if doors or windows are violated while system is disarmed and chime mode is ON.
Test Mode	*To turn ON:* Enter code. Press TEST key, then [0]. *To turn OFF:* Enter code. Press OFF key.	Tests alarm sounder and allows sensors to be tested.
Phone Access if applicable	Consult *Phone Access User's Guide* that accompanies the Phone Module.	Permits system access remotely, via Touch-tone phone.

Summary of Audible/Visual Notifications

Fixed-Word Display Keypads

SOUND	CAUSE	DISPLAY
LOUD, INTERRUPTED* Keypad & Ext.	FIRE ALARM	**FIRE** is displayed; zone number of zone in alarm is displayed. If a fire alarm is manually activated, zone number 95 will be displayed.
LOUD, CONTINUOUS* Keypad & Ext.	BURGLARY/AUDIBLE EMERGENCY ALARM	**ALARM** is displayed. Zone number of zone in alarm is also displayed.
ONE SHORT BEEP (not repeated) Keypad only	a. SYSTEM DISARM b. SYSTEM ARMING ATTEMPT WITH AN OPEN ZONE. c. BYPASS VERIFY	a. READY indicator light comes on. b. Number of the open protection zone displayed. c. Zone numbers of the bypassed protection zones are displayed (one beep is heard for each zone displayed). Subsequently, **BYPASS** is displayed.
ONE SHORT BEEP (once every 40 secs) Keypad only	a. SYSTEM IS IN TEST MODE b. LOW BATTERY AT A TRANSMITTER c. SYSTEM WILL AUTOARM WITHIN 10 MINUTES	a. Opened zone numbers will appear. b. **BAT** displayed with zone number of transmitter. c. No special display.
TWO SHORT BEEPS Keypad only	ARM AWAY or MAXIMUM	**AWAY** is displayed. Red ARMED indicator is lit.
THREE SHORT BEEPS Keypad only	a. ARM STAY, NIGHT-STAY, INSTANT b. ZONE OPENED WITH SYSTEM IN CHIME MODE.	a. **STAY** or **INSTANT** is displayed. Red ARMED indicator is lit. b. **CHIME** displayed, zone number of open protection zone will be displayed if the [✱] key is pressed.
RAPID BEEPING Keypad only	a. TROUBLE b. MEMORY OF ALARM c. SYSTEM LOW BATTERY d. EXT. SOUNDER WIRING FAIL e. LAST 10 SEC of EXIT DELAY	a. **CHECK** displayed. Zone number of troubled protection zone is displayed. b. **FIRE** or ALARM is displayed; zone number of zone in alarm is displayed. c. **BAT** displayed with no zone ID number. d. **CHECK 70** is displayed. e. No special display.
SLOW BEEPING Keypad only	a. EXIT DELAY WARNING b. ENTRY DELAY WARNING	a. **AWAY** is displayed. b. Exceeding the entry delay time without disarming causes alarm.

* If a bell is used as external sounder, fire alarm is *pulsed ring*; burglary/audible emergency is *steady ring*.

Summary of A/V Notifications (cont'd)

Alpha Display Keypads

SOUND	CAUSE	DISPLAY
LOUD, INTERRUPTED* Keypad & Ext.	FIRE ALARM.	**FIRE** is displayed; descriptor of zone in alarm is displayed. If a fire alarm is manually activated, zone number 95 will be displayed.
LOUD, CONTINUOUS* Keypad & Ext.	BURGLARY/AUDIBLE EMERGENCY ALARM.	**ALARM** is displayed. If programmed, descriptor of zone in alarm is also displayed
ONE SHORT BEEP (not repeated) Keypad only	a. SYSTEM DISARM. b. SYSTEM ARMING ATTEMPT WITH AN OPEN ZONE. c. BYPASS VERIFY.	a. **DISARMED/READY TO ARM** is displayed. b. Number and descriptor of open protection zone is displayed. c. Numbers and descriptors of the bypassed zones are displayed (One beep is heard for each zone displayed). Then, the following is displayed: **DISARMED BYPASS /Ready to Arm.**
ONE SHORT BEEP (once every 40 seconds) Keypad only	a. SYSTEM IS IN TEST MODE. b. LOW BATTERY AT A TRANSMITTER. c. SYSTEM WILL AUTOARM WITHIN 10 MINUTES	a. Opened Zone identifications will appear. b. **LO BAT** displayed with description of transmitter. c. No special display.
TWO SHORT BEEPS Keypad only	ARM AWAY or MAXIMUM.	**ARMED AWAY or MAXIMUM** displayed. Red ARMED indicator lit.
THREE SHORT BEEPS Keypad only	a. ARM STAY, NIGHT-STAY, OR INSTANT. b. ZONE OPENED WHILE SYSTEM IS DISARMED.	a. **ARMED STAY** or **ARMED INSTANT** displayed. Red ARMED indicator lit. b. **CHIME** displayed, descriptor of open protection zone will be displayed if the [✱] key is pressed.
RAPID BEEPING Keypad only	a. TROUBLE. b. MEMORY OF ALARM. c. SYSTEM LOW BATTERY. d. EXT. SOUNDER WIRE FAIL. e. LAST 10 SEC of EXIT DELAY	a. **CHECK** displayed. Descriptor of troubled protection zone is displayed. b. **FIRE** or **ALARM** is displayed; descriptor of zone in alarm is displayed. c. **SYSTEM LO BAT** displayed. d. **BELL FAILURE** is displayed. e. No special display.
SLOW BEEPING Keypad only	a. EXIT DELAY WARNING (if programmed). b. ENTRY DELAY WARNING.	a. **ARMED AWAY or MAXIMUM** is displayed along with **You May Exit Now.** b. **DISARM SYSTEM OR ALARM WILL OCCUR** is displayed. **Exceeding the delay time without disarming causes an alarm.**

* If a bell is used as external sounder, fire alarm is *pulsed ring*; burglary/audible emergency is *steady ring*.

Regulatory Statements and Warnings

WARNING: This is a Class A product. In a domestic environment, this product may cause radio interference in which case the user may be required to take adequate measures.

RADIO FREQUENCY EMISSIONS

Federal Communications Commission (FCC) Part 15

This device complies with part 15 of the FCC rules. Operation is subject to the following two conditions: (1) This device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

Industry Canada

This Class B digital apparatus complies with Canadian ICES-003.
Cet Appareil numerique de la classe B est conforme a la norme NMB-003 du Canada.

TELEPHONE/MODEM INTERFACE

FCC Part 68

This equipment complies with Part 68 of the FCC rules. On the front cover of this equipment is a label that contains the FCC registration number and Ringer Equivalence Number (REN). You must provide this information to the telephone company when requested.

This equipment uses the following USOC jack: RJ31X.

This equipment may not be used on telephone company-provided coin service. Connection to party lines is subject to state tariffs. This equipment is hearing-aid compatible.

Industry Canada

NOTICE: The Industry Canada Label identifies certified equipment. This certification means that the equipment meets telecommunications network protective, operational and safety requirements as prescribed in the appropriate Terminal Equipment Technical Requirements document(s). The Department does not guarantee the equipment will operate to the user's satisfaction.

Before installing this equipment, users should ensure that it is permissible to be connected to the facilities of the local telecommunications company. The equipment must also be installed using an acceptable method of connection. The customer should be aware that compliance with the above conditions may not prevent degradation of service in some situations.

Repairs to certified equipment should be coordinated by a representative designated by the supplier. Any repairs or alterations made by the user to this equipment, or equipment malfunctions, may give the telecommunications company to request the user to disconnect the equipment.

Users should ensure for their own protection that the electrical ground connections of the power utility, telephone lines and internal metallic water pipe system, if present, are connected together. This precaution may be particularly important in rural areas.

Caution: Users should not attempt to make such connections themselves, but should contact appropriate electric inspection authority, or electrician, as appropriate.

Ringer Equivalence Number Notice:

The **Ringer Equivalence Number** (REN) assigned to each terminal device provides an indication of the maximum number of terminals allowed to be connected to a telephone interface. The termination on an interface may consist of any combination of devices subject only to the requirement that the sum of the Ringer Equivalence Numbers of all the devices does not exceed

Regulatory Statements (cont'd)

Industrie Canada

AVIS: l'étiquette d'Industrie Canada identifie le matériel homologué. Cette étiquette certifie que le matériel est conforme aux normes de protection, d'exploitation et de sécurité des réseaux de télécommunications, comme le prescrivent les documents concernant les exigences techniques relatives au matériel terminal. Le Ministère n'assure toutefois pas que le matériel fonctionnera à la satisfaction de l'utilisateur.

Avant d'installer ce matériel, l'utilisateur doit s'assurer qu'il est permis de le raccorder aux installations de l'enterprise locale de télécommunication. Le matériel doit également être installé en suivant une méthode acceptée da raccordement. L'abonné ne doit pas oublier qu'il est possible que la conformité aux conditions enoncées ci-dessus n'empêche pas la dégradation du service dans certaines situations.

Les réparations de matériel nomologué doivent être coordonnees par un representant designe par le fournisseur. L'entreprise de télécommunications peut demander à l'utilisateur da débrancher un appareil a la suite de réparations ou de modifications effectuées par l'utilisateur ou à cause de mauvais fonctionnement.

Pour sa propre protection, l'utilisateur doit s'assurer que tous les fils de mise à la terre de la source d'energie électrique, de lignes téléphoniques et des canalisations d'eau métalliques, s'il y en a, sont raccordés ensemble. Cette precaution est particulièrement importante dans les régions rurales.

Avertissement : L'utilisateur ne doit pas tenter de faire ces raccordements lui-même; il doit avoir racours à un service d'inspection des installations électriques, ou à un électricien, selon le cas.

AVIS : L'indice d'équivalence de la sonnerie (IES) assigne a chaque dispositif terminal indique le nombre maximal de terminaux qui peuvent être raccordes a une interface. La terminaison d'une interface téléphonique pent consister en une combinaison de quelques dispositifs, à la seule condition que la somme d'indices d'équivalence de la sonnerie de tous les dispositifs n'excede pas 5.

System Features Log

Features	Comments		
Exit Delay	Part. 1:	Part. 2:	
Entry Delay 1	Part. 1:	Part. 2:	
Entry Delay 2	Part. 1:	Part. 2:	
NIGHT-STAY Zones	Zones:		
Quick Arm	yes	no	
Quick Bypass	yes	no	
Automatic Paging	yes	no	users:
Keyswitch Arming (circle type of LED lighting)	Arm AWAY	steady	flash
	Arm STAY	steady	flash

Function Keys	A	B	C	D	Comments
• Single-Button Arming					
• Step Arming					
• Paging (see Paging chart)					
• Time/Date Display					
• Macro Key 1					
• Macro Key 2					
• Macro Key 3					
• Macro Key 4					
• Emergency Key*: Personal					
• Emergency Key*: Silent Alarm					
• Emergency Key*: Audible Alarm					
• Emergency Key*: Fire					
• Device Activation					Device:

* Features marked with this single asterisk apply to the VISTA 20P Series only.

** Emergency Keys: A = [1] [ ] B = [ ] [#] C = [3] [#]

System Features Log (cont'd)

User Setup

The following chart will help keep track of system users. Copies should be distributed to the partition† 1 and partition† 2 (if applicable) masters for their records.

To program a user attribute:
Enter system/partition* master code + [8] + user no. + "#" command listed in column heading.

User No.	User Name	User's Part(s).† (system master only) [#] [3] + part(s) + [#]	Security Code enter new code	Auth. Level [#] [1] + level	Access Group [#] [2] + group	RF Zone Number [#] [4] + zone no	Pager on/off [#] [5] + 0/1
01	installer	(all)		installer			(1)
02	system master	(all)		master			(1)
03	partition 1 master	(1)		(4)			(1)
04		(1)		(0)			(1)
05		(1)		(0)			(1)
06		(1)		(0)			(1)
07		(1)		(0)			(1)
08		(1)		(0)			(1)
09		(1)		(0)			(1)
10		(1)		(0)			(1)
11		(1)		(0)			(1)
12		(1)		(0)			(1)
13		(1)		(0)			(1)
14		(1)		(0)			(1)
15		(1)		(0)			(1)
16		(1)		(0)			(1)
17		(1)		(0)			(1)
18		(1)		(0)			(1)
19		(1)		(0)			(1)
20		(1)		(0)			(1)
21		(1)		(0)			(1)
22		(1)		(0)			(1)
23		(1)		(0)			(1)
24		(1)		(0)			(1)
25		(1)		(0)			(1)
26		(1)		(0)			(1)
27		(1)		(0)			(1)
28		(1)		(0)			(1)
29		(1)		(0)			(1)
30		(1)		(0)			(1)
31		(1)		(0)			(1)
32		(1)		(0)			(1)

* Partitions apply to the VISTA-20P Series only.

User Setup (cont'd)

Enter system/partition master code + [8] + user no. + "#" command listed in column heading.

User No.*	User Name	User's Part(s). (system master only) [#] [3] + part(s) + [#]	Security Code enter new code	Auth. Level [#] [1] + level	Access Group [#] [2] + group	RF Zone Number [#] [4] + zone no	Pager on/off [#] [5] + 0/1
33	partition 2 master	(2)		(4)			(1)
34		(2)		(0)			(1)
35		(2)		(0)			(1)
36		(2)		(0)			(1)
37		(2)		(0)			(1)
38		(2)		(0)			(1)
39		(2)		(0)			(1)
40		(2)		(0)			(1)
41		(2)		(0)			(1)
42		(2)		(0)			(1)
43		(2)		(0)			(1)
44		(2)		(0)			(1)
45		(2)		(0)			(1)
46		(2)		(0)			(1)
47		(2)		(0)			(1)
48		(2)		(0)			(1)
49		(2)		(0)			(1)

Authority Levels: 0 = standard user
1 = arm only
2 = guest
3 = duress
4 = partition master

Partitions: 0 = clears partition 1 and partition 2 defaults
1 = partition 1 and common
2 = partition 2 and common
3 = common partition only

Paging: 0 = no paging; 1 = allow paging

* Users 34-49 apply to VISTA-20P Series only; user 33 is partition 2 master for VISTA-20P Series, and the last user for VISTA-15P Series.

Paging Setup

Pager	Pager Phone Number\ Prefix Characters	Automatically Reports Upon... open/close p1	open/close p2	alarm/trouble p1	alarm/trouble p2	zone list p1	zone list p2	Sched.	Func Key
1									
2									
3**									
4**									

** Pagers 3 and 4 and partitions apply to VISTA-20P Series only.

System Features Log *(cont'd)*

Schedules*: master code + [#] + [6] [4]

No.	Event (see list below)	Device No. for "01" events (see device list below)	Group No. for "02" events enter 1-8	Partition for "04-06" events enter 1, 2, or 3	Start Time/ Day	Stop Time/ Day	Repeat (1-4)	Random (yes/no)
01								
02								
03								
04								
05								
06								
07								
08								
09								
10								
11								
12								
13								
14								
15								
16								

Events: 00 = clear event; 01 = device on/off; 02 = user access; 03 = latch key report; 04 = forced STAY arm; 05 = forced AWAY arm; 06 = auto disarm; 07 = display "reminder"

Repeat Options: 0 = none; 1 = repeat weekly; 2 = repeat every other week; 3 = repeat every third week; 4 = repeat every fourth week

VISTA-20P Series can use schedules 01-16. VISTA-15P Series can only use schedules 01-04

** Partitions apply to the VISTA-20P Series only

List of Output Devices

Device	Description	Schedule No.	Function Key
01			
02			
03			
04			
05			
06			
07			
08			
09			
10			
11			
12			
13			
14			
15			
16			
17			
18			

* VISTA-20P Series can use devices 01-16. VISTA-15P Series can only use devices 01-08; both can use trigger devices 17-18.

OWNER'S INSURANCE PREMIUM CREDIT REQUEST

This form should be completed and forwarded to your homeowner's insurance carrier for possible premium credit.

A. GENERAL INFORMATION:

Insured's Name and Address: _____

_____

Insurance Company: _____ Policy No.: _____

VISTA-20P / VISTA-15P Other _____

(circle the appropriate model number)

Type of Alarm: ☐ Burglary ☐ Fire ☐ Both

Installed by: _____ Serviced by: _____

Name Name

_____ _____

Address Address

B. NOTIFIES (Insert B = Burglary, F = Fire)

Local Sounding Device _____ Police Dept. _____ Fire Dept.

Central Station ☐ Name: _____

Address: _____

Phone: _____

C. POWERED BY: A.C. With Rechargeable Power Supply

D. TESTING: ☐ Quarterly ☐ Monthly ☐ Weekly ☐ Other

continued on other side

OWNER'S INSURANCE PREMIUM CREDIT REQUEST (cont.)

E. SMOKE DETECTOR LOCATIONS

☐ Furnace Room ☐ Kitchen ☐ Bedrooms ☐ Attic

☐ Basement ☐ Living Room ☐ Dining Room ☐ Hall

F. BURGLARY DETECTING DEVICE LOCATIONS:

☐ Front Door ☐ Basement Door ☐ Rear Door ☐ All Exterior Doors

☐ 1st Floor Windows ☐ All windows ☐ Interior locations

☐ All Accessible Openings, Including Skylights, Air Conditioners and Vents

G. ADDITIONAL PERTINENT INFORMATION:

_____

_____

_____

_____

_____

Signature: _____ Date: _____

– Notes –

– Notes –

LIMITATIONS OF THIS SYSTEM

WARNING! THE LIMITATIONS OF THIS ALARM SYSTEM

While this system is an advanced design security system, it does not offer guaranteed protection against burglary or other emergency. Any alarm system, whether commercial or residential, is subject to compromise or failure to warn for a variety of reasons. For example:

- Intruders may gain access through unprotected openings or have the technical sophistication to bypass an alarm sensor or disconnect an alarm warning device.
- Intrusion detectors (e.g. passive infrared detectors), smoke detectors, and many other sensing devices will not work without power. Battery operated devices will not work without batteries, with dead batteries, or if the batteries are not put in properly. Devices powered solely by AC will not work if their AC power supply is cut off for any reason, however briefly.
- Signals sent by wireless transmitters may be blocked or reflected by metal before they reach the alarm receiver. Even if the signal path has been recently checked during a weekly test, blockage can occur if a metal object is moved into the path.
- A user may not be able to reach a panic or emergency button quickly enough.
- While smoke detectors have played a key role in reducing residential fire deaths in the United States, they may not activate or provide early warning for a variety of reasons in as many as 35% of all fires, according to data published by the Federal Emergency Management Agency. Some of the reasons smoke detectors used in conjunction with this System may not work are as follows. Smoke detectors may have been improperly installed and positioned. Smoke detectors may not sense fires that start where smoke cannot reach the detectors, such as in chimneys, in walls, or roofs, or on the other side of closed doors. Smoke detectors also may not sense a fire on another level of a residence or building. A second floor detector, for example, may not sense a first floor or basement fire. Moreover, smoke detectors have sensing limitations. No smoke detector can sense every kind of fire every time. In general, detectors may not always warn about fires caused by carelessness and safety hazards like smoking in bed, violent explosions, escaping gas, improper storage of flammable materials, overloaded electrical circuits, children playing with matches, or arson. Depending upon the nature of the fire and/or the locations of the smoke detectors, the detector, even if it operates as anticipated, may not provide sufficient warning to allow all occupants to escape in time to prevent injury or death.
- Passive Infrared Motion Detectors can only detect intrusion within the designed ranges as diagrammed in their installation manual. Passive Infrared Detectors do not provide volumetric area protection. They do create multiple beams of protection, and intrusion can only be detected in unobstructed areas covered by those beams. They cannot detect motion or intrusion that takes place behind walls, ceilings, floors, closed doors, glass partitions, glass doors, or windows.

  Mechanical tampering, masking, painting or spraying of any material on the mirrors, windows or any part of the optical system can reduce their detection ability. Passive Infrared Detectors sense changes in temperature; however, as the ambient temperature of protected area approaches the temperature range of 90° to 105°F, the detection performance can decrease.
- Alarm warning devices, such as sirens, bells or horns may not alert people or wake up sleepers if they are located on the other side of closed or partly open doors. If warning devices sound on a different level of the residence from the bedrooms, then they are less likely to waken or alert people inside the bedroom. Even persons who are awake may not hear the warning if the alarm is muffled from a stereo, radio, air conditioner or other appliance, or by passing traffic. Finally, alarm warning devices, however loud, may not warn hearing impaired people or waken deep sleepers.
- Telephone lines needed to transmit alarm signals from a premises to a central monitoring station may be out of service or temporarily out of service. Telephone lines are also subject to compromise by sophisticated intruders.
- Even if the system responds to the emergency as intended, however, occupants may have insufficient time to protect themselves from the emergency situation. In the case of a monitored alarm system, authorities may not respond appropriately.
- This equipment, like other electrical devices, is subject to component failure. Even though the equipment is designed to last as long as 10 years, the electronic components could fail at any time.

The most common cause of an alarm system not functioning when an intrusion or fire occurs is inadequate or [illegible]. This alarm system should be tested weekly to make sure all sensors and transmitters are working properly.

Installing an alarm system may make one eligible for lower insurance rates, but an alarm system is not a substitute for insurance. Homeowners, property owners and renters should continue to act prudently to protect themselves and continue to insure their lives and property.

We continue to develop new and improved protection devices. Users of alarm systems owe it to their clients and their loved ones to learn about these development.

D-18
Control Panel

ADVANTECH
CORPORATION

20 Just Road
Fairfield, NJ 07004
Phone: (973) 808 8550
Fax: (973) 808 2923
E-mail: info@advantechcorp.com

SITE 1 AREA NAVAL WEAPONS INDUSTRIAL RESERVE PLANT BETHPAGE, NEW YORK

Control Devices and Panel Drawings

SUBMITTAL

October 7, 2009

Contractor:
Tetra Tech EC, Inc.
Bucks Town Corporate Campus
820 Towne Center Dr. Ste. 100
Langhorne, PA 19047

Integration Services Provided by:
AdvanTech Corporation
20 Just Road
Fairfield, New Jersey 07004
Phone: (973) 808 8550
Fax: (973) 808 2923

AdvanTech Corporation Job No. - TT4164
Contractor Job No. – N62473-07-D-3211

ADVANTECH CORPORATION

20 Just Road
Fairfield, New Jersey 07004
Tel: 973-808-8550
Fax: 973-808-2923
E-mail: info@advantechcorp.com

Submittal 10/07/09

Project Title:	Site 1 Area Naval Weapons Industrial Reserve Plant; Bethpage, New York
Project Customer:	U.S. Navy NAVFAC SW RAC V
Contract No.:	N62473-07-D-3211
AdvanTech Job No:	4164
Contractor:	Tetra-Tech EC, Inc.

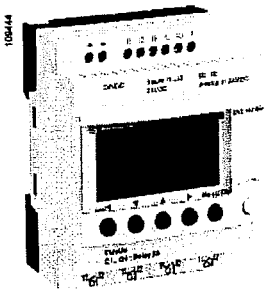
Relays

Description	Manufacturer	Part No.	Qty.
Zelio Logic Smart Relay	Schneider Electric	SR3B261FU	1
120 VAC Relay	Weidmüller	8533771001	2

Notes:

Approved by:_____ Date:_____

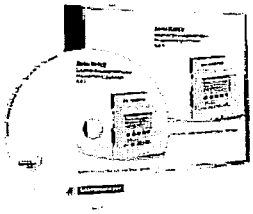
Zelio Logic smart relays
Modular smart relays



SR3 B101BD

Modular smart relays with display

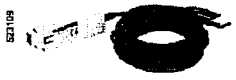
Number of I/O	Discrete inputs	Including ⎓ 0-10 V analogue inputs	Relay outputs	Transistor outputs	Clock	Reference	Weight kg
Supply ~ 24 V							
10	6	0	4	0	Yes	SR3 B101B	0.250
26	16	0	10 *(1)*	0	Yes	SR3 B261B	0.400
Supply ~ 100...240 V							
10	6	0	4	0	Yes	SR3 B101FU	0.250
26	16	0	10 *(1)*	0	Yes	SR3 B261FU	0.400
Supply ⎓ 12 V							
26	16	6	10 *(1)*	0	Yes	SR3 B261JD *(2)*	0.400
Supply ⎓ 24 V							
10	6	4	4	0	Yes	SR3 B101BD	0.250
			0	4	Yes	SR3 B102BD	0.220
26	16	6	10 *(1)*	0	Yes	SR3 B261BD	0.400
			0	10	Yes	SR3 B262BD	0.300



SR2 SFT01

"Zelio Soft 2" software for PC

Description	Application	Reference	Weight kg
Programming software "Zelio Soft 2", multi-language	For PC, supplied on CD-ROM *(3)*, compatible with Windows 98, NT, 2000, XP	SR2 SFT01	0.200



SR2 USB01

Accessories

Connection accessories

Description	Application	Length	Reference	Weight kg
Connecting cable	Between the PC (USB connector) and the Zelio Logic smart relay	3 m	SR2 USB01	0.100

Other accessories: see pages 14102/22 and 14102/23

Modular "discovery" packs

Number of I/O	Pack contents: - Compact smart relay with display - "Zelio Soft 2" programming software supplied on CD-Rom - Cable SR2 USB01 for connection to PC *(4)*	Reference	Weight kg
	Description of compact smart relay with display		
Supply ~ 100...240 V			
10	SR3 B101FU	SR3 PACKFU	0.700
26	SR3 B261FU	SR3 PACK2FU	0.850
Supply ⎓ 24 V			
10	SR3 B101BD	SR3 PACKBD	0.700
26	SR3 B261BD	SR3 PACK2BD	0.850

SR2 PACK•••

(1) Including 8 outputs at maximum current of 8 A and 2 outputs at maximum current of 5 A.
(2) Can only be used with "Zelio Soft 2" software version ≥ V 3.1.
(3) CD-ROM comprising "Zelio Soft 2" software, an application library, a self-training manual, installation instructions and a user's manual.
(4) Replaces cable SR2 CBL01 which is still available separately, as an accessory (see page 14102/22).

***Note:** The Zelio Logic smart relay end its associated extensions must have an identical voltage.*

General environment characteristics

Type			SR2A / SR2B / SR2D / SR2E / SR3B / SR3XT••1••
Product certifications			UL, CSA, GL, C-Tick, GOST
Conformity with the low voltage directive	Conforming to 2006/95/EC		EN (IEC) 61131-2 (open equipment)
Conformity with the EMC directive	Conforming to 2004/108/EC		EN (IEC) 61131-2 (Zone B) EN (IEC) 61000-6-2, EN (IEC) 61000-6-3 *(1)* and EN (IEC) 61000-6-4
Degree of protection	Conforming to IEC/EN 60529		IP 20 (terminal block), IP 40 (front panel)
Overvoltage category	Conforming to IEC/EN 60664-1		3
Degree of pollution	Conforming to IEC/EN 61131-2		2
Ambient air temperature around de device conforming to IEC 60028-2-1 and IEC 60068-2-2	Operation	°C	- 20...+ 55 (+ 40 in non-ventilated enclosure)
	Storage	°C	- 40...+ 70
Maximum relative humidity	Conforming to IEC/EN 60068-2-30		95% without condensation or dripping water
Maximum operating altitude	Operation	m	2000
	Transport	m	3048
Mechanical resistance	Immunity to vibration		IEC/EN 60068-2-6, test Fc
	Immunity to mechanical shock		IEC/EN 60068-2-27, test Ea
Resistance to electrostatic discharge	Immunity to electrostatic discharge		IEC/EN 61000-4-2, level 3
Resistance to HF interference (immunity)	Immunity to electromagnetic radiated fields		IEC/EN 61000-4-3
	Immunity to fast transients in bursts		IEC/EN 61000-4-4, level 3
	Immunity to shock waves		IEC/EN 61000-4-5
	Radio frequency in common mode		IEC/EN 61000-4-6, level 3
	Voltage dips and breaks (~)		IEC/EN 61000-4-11
	Immunity to damped oscillation waves		IEC/EN 61000-4-12
Conducted and radiated emissions	Conforming to EN 55022/11 (Group 1)		Class B *(1)*
Connection capacity to screw terminals	Flexible cable with cable end	mm^2	1 conductor: 0.25...2.5, cable: AWG 24...AWG 14 2 conductors: 0.25...0.75, cable: AWG 24...AWG 18
	Semi-solid cable	mm^2	1 conductor: 0.2...2.5, cable: AWG 25...AWG 14
	Solid cable	mm^2	1 conductor: 0.2...2.5, cable: AWG 25...AWG 14 2 conductors: 0.2...1.5, cable: AWG 24...AWG 16
	Tightening torque	N.m	0.5 (tightened using Ø 3.5 mm screwdriver)

Processing characteristics

Number of control scheme lines	With LADDER programming		120
Number of function blocks	With FBD programming		Up to 200
Cycle time		ms	6...90
Response time		ms	Input acquisition time + 1 to 2 cycle times
Backup time (in the event of power failure)	Day/time		10 years (lithium battery) at 25 °C
	Program and adjustments in the Zelio Logic smart relay and in EEPROM memory cartridge SR2 MEM0•		10 years
Program memory checking			On each power-up
Clock drift			12 min/year (0 to 55 °C) 6 sec/month (at 25 °C and calibration)
Timer block accuracy			1% ± 2 of the cycle time

(1) Except for configuration SR3 B•••BD + SR3 MBU01BD + SR3 XT43BD or SR3 B•••BD + SR3 NET01BD + SR3 XT43BD class A (class B: use in a metal enclosure).

Supply characteristics, ~ 100...240 V products

Type				SR2●●●1FU SR2 ●121FU	SR2 ●201FU	SR3 B101FU	SR3 B261FU
Nominal voltage			V	~ 100...240			
Voltage limits			V	~ 85...264			
Nominal frequency			Hz	50-60			
Nominal input current	Without extensions		mA	80/30	100/50	80/30	100/50
	With extensions		mA	–		80/40	80/60
Power dissipated	Without extensions		VA	7	11	7	12
	With extensions		VA	–		12	17
Micro-breaks	Permissible duration		ms	10			
rms insulation voltage			V	~ 1780			

Discrete input characteristics, ~ 100...240 V products

Type				SR● ●●●●FU
Nominal value of inputs	Voltage		V	~ 100... 240
	Current		mA	0.6
	Frequencies		Hz	47...53 and 57...63
Input switching limit values	At state 1	Voltage	V	≥ ~ 79
		Current	mA	> 0.17
	At state 0	Voltage	V	≤ ~ 40
		Current	mA	< 0.5
Input impedance at state 1			KΩ	350
Response time	LADDER language	State 0 to 1 (50/60 Hz)	ms	50
		State 1 to 0 (50/60 Hz)	ms	50
	FBD language	State 0 to 1 (50/60 Hz)	ms	50 min., 255 max. (in increments of 10)
		State 1 to 0 (50/60 Hz)	ms	50 min., 255 max. (in increments of 10)
Isolation	Between supply and inputs			None
	Between inputs			None
Protection	Against inversion of terminals			Yes (control instructions not executed)

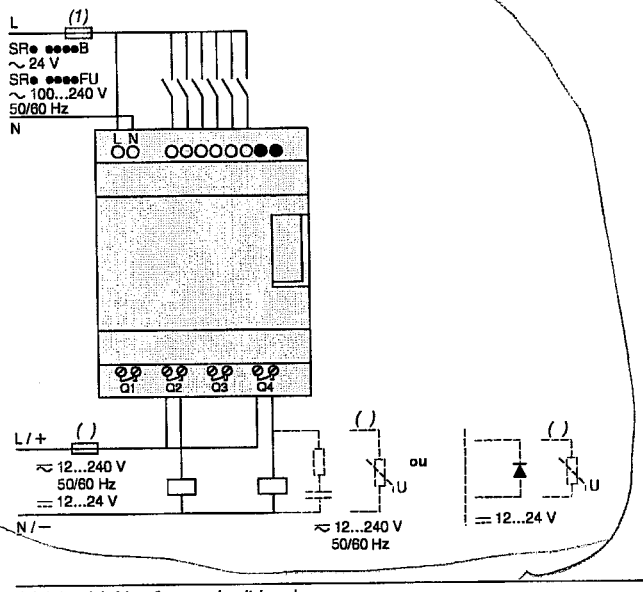
Relay output characteristics, ~ 100...240 V products

Type				SR2 ●101FU SR2 ●121FU SR3 B101FU SR3 XT101FU	SR2 ●201FU	SR3 B261FU	SR3 XT61FU	SR3 XT141FU
Operating limit values			V	⎓ 5...30, ~ 24...250				
Contact type				N/O				
Thermal current			A	4 outputs: 8 A	8 outputs: 8 A	8 outputs: 8 A 2 outputs: 5 A	2 outputs: 8 A	4 outputs: 8 A 2 outputs: 5 A
Electrical durability for 500 000 operating cycles Conforming to IEC/EN 60947-5-1	Utilisation category	DC-12	V	⎓ 24				
			A	1.5				
		DC-13	V	⎓ 24 (L/R = 10 ms)				
			A	0.6				
		AC-12	V	~ 230				
			A	1.5				
		AC-15	V	~ 230				
			A	0.9				
Minimum switching capacity	At minimum voltage of ⎓ 12 V		mA	10				
Low power switching reliability of contact				⎓ 12 V - 10 mA				
Maximum operating rate	No-load		Hz	10				
	At Ie (operational current)		Hz	0.1				
Mechanical life	In millions of operating cycles			10				
Rated impulse withstand voltage	Conforming to IEC/EN 60947-1 and IEC/EN 60664-1		kV	4				
Response time	Set		ms	10				
	Reset		ms	5				
Built-in protection	Against short-circuits			None				
	Against overvoltage and overload			None				

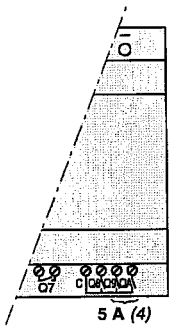
Presentation : pages 14102/2 to 14102/5 | Functions : pages 14102/6 to 14102/8 | Curves : pages 14102/16 and 14102/17 | References : pages 14102/18 to 14102/23 | Dimensions, schemes : pages 14102/24 to 14102/27

Connection of smart relays on ~ supply

SR● ●●●1B, SR● ●●●1FU



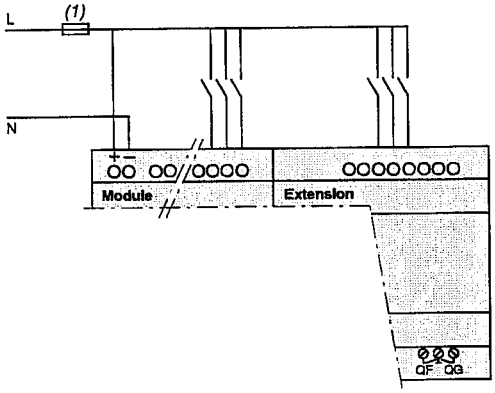
SR3 B261B and SR3 B261FU



(1) 1 A quick-blow fuse or circuit-breaker.
(2) Fuse or circuit-breaker.
(3) Inductive load.
(4) Q9 and QA: 5 A (max. current in terminal C: 10 A).

With discrete I/O extension module

SR3 B●●●B + SR3 XT●●●B, SR3 B●●●FU + SR3 XT●●●FU



Warning: QF and QG: 5 A for **SR3 XT141●●**

(1) 1 A quick-blow fuse or circuit-breaker.

Product Data Sheet

SR3B261FU

Relay , Zelio Logic 2, Supply Voltage: 120/240VAC

List Price $486.00 USD

Availability **Stock Item: This item is normally stocked in our distribution facility.**

Technical Characteristics

Approvals	UL Listed - CSA Certified
Connection Type	Screw Clamp
Marketing Trade Name	Zello Logic 2
Width	124.6mm
Type	SR3
Depth	59.5mm
Height	107.6mm
Number of Input/Outputs	16 Discrete Inputs - 10 Relay Outputs
Weight	0.400 Kilogram
Operating Temperature Range	-20 to +55 Degrees C; (+40 in enclosure); coforming to IEC 60068-2-1 and IEC 60068-2-2
Clock	Yes
Display	Yes
Supply Voltage	120/240VAC
Module Type	Modular
Body Type	Modular

Shipping and Ordering

Category	22378 -
Discount Schedule	I
GTIN	00785901571896
Package Quantity	1
Weight	0.85 lbs.
Availability Code	Stock Item: This item is normally stocked in our distribution facility.
Returnability	Y
Country of Origin	FR

As standards, specifications, and designs change from time to time, please ask for confirmation of the information given in this document.

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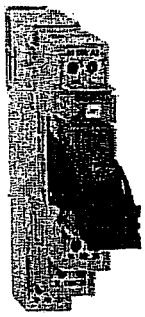
Schneider Electric

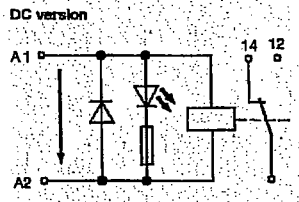
PLUGSERIES

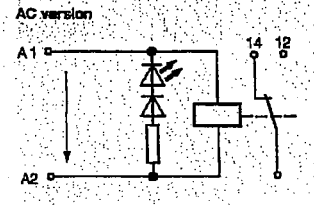
1 change-over contact

Construction kit consists of
- Relay-socket for mounting-rail
- LED-indicator / RC-combination
- Retaining bracket
- Pluggable relay

Cross-connection of the coil connections and change-over contacts of the relay with pluggable cross-connection ZQV 2.5N



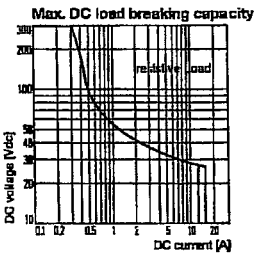


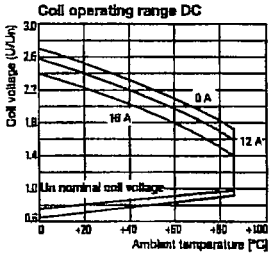


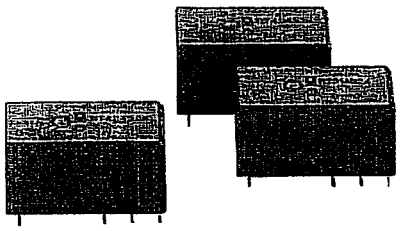
Output	
Max. switching voltage AC/Continuous current	250V/10A
Min. switching power	10V/100mA
Response time / Release time	5.8ms/6.9ms
Contact base material	AgNi 90/10
Mechanical endurance	30x10^6 switching cycles
Max. switching frequency at rated load	0.1Hz
Rated data	
Status indicator/Free wheel diode/Reverse volt. prot.	LED green/Yes/not available
Ambient temp., fitted w. distance	-25 °C...+50 °C
Storage temperature	-40 °C...+50 °C
Climate	40°C/93% rel. humidity without condensation
Approvals	CE, cURus
Insulation coordinates (EN 50 178)	
Standards	EN 50178
Rated voltage	250V
Impulse withstand voltage	6 kV
Creepage and clearance path input - output	>8mm
Overvoltage category	III
Pollution severity	2
Secure separation acc. to VDE 0106 Part 101	Yes

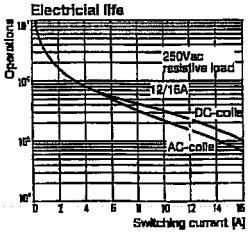
Dimensions		Screw connection	Tension clamp connection
Clamping range (rating- / min. / max.)	mm²	2.5 / 0.5 / 2.5	2.5 / 0.5 / 2.5
Length x width x height	mm	92.0 / 15.3 / 85.0	92.0 / 15.3 / 87.0
Information			

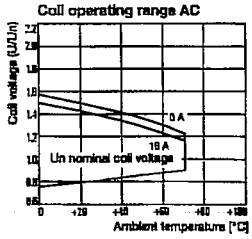
Applications











Articles with coloured order number are kept permanently in stock at the central warehouse in Germany.
Delivery times see page X.2

PLUGSERIES

1 change-over contact

Ordering data	12VDC 1CO	24VDC 1CO	115VDC 1CO	24VAC 1CO
Input				
Rated voltage	12 Vdc +/- 20 %	24 Vdc +/- 10 %	115 Vdc +/- 10 %	24 Vac +/- 10 %
Rated current AC				32mA
Rated current DC	33mA	16mA	3.5mA	
Power rating	400mW	400mW	400mW	0.75VA
Oper.-/drop-out volt. AC-coil				17V/3.6V
Oper.-/drop-out volt. DC-coil	8.4V/1.2V	16.8 V / 2.4 V	76 V / 11 V	
Pull-in curr./release curr. AC-coil				
Pull-in curr./release curr. DC-coil				
Ordering data Complete module				
Screw connection Type	PRS 12Vdc LD 1CO	PRS 24Vdc LD 1CO	PRS 115Vdc LD 1CO	PRS 24Vac LD 1CO
Order No.	8536471001	8530621001	8536510000	8536630000
Tension clamp connection Type	PRZ 12Vdc LD 1CO	PRZ 24Vdc LD 1CO	PRZ 115Vdc LD 1CO	PRZ 24Vac LD 1CO
Order No.	8536571001	8530691001	8536610000	8536651001
Ordering data Spare relay, pluggable				
Type	RCL 314012 12Vdc-Rel1U	RCL 314024 24Vdc-Rel1U	RCL 314110 110Vdc-Rel1U	RCL 315524 24Vac-Rel1U
Order No.	4058470000	4058480000	4058500000	4058510000
Information				

Ordering data	120VAC 1CO	230VAC 1CO		
Input				
Rated voltage	120 Vac +/- 10 %	230 Vac +/- 10 %		
Rated current AC	6.6mA	3.2mA		
Rated current DC				
Power rating	0.75VA	0.75VA		
Oper.-/drop-out volt. AC-coil	86.3V/17.3V	171 V / 34 V		
Oper.-/drop-out volt. DC-coil				
Pull-in curr./release curr. AC-coil				
Pull-in curr./release curr. DC-coil				
Ordering data Complete module				
Screw connection Type	PRS 120Vac LD 1CO	PRS 230Vac LD 1CO		
Order No.	8530641001	8530671001		
Tension clamp connection Type	PRZ 120Vac LD 1CO	PRZ 230Vac LD 1CO		
Order No.	8530710000	8530731001		
Ordering data Spare relay, pluggable				
Type	RCL 314615 115Vac-Rel1U	RCL 314730 230Vac-Rel1U		
Order No.	4058520000	4058540000		
Information				

Articles with coloured order number are kept permanently in stock at the central warehouse in Germany.
Delivery times see page X.2

ADVANTECH CORPORATION

20 Just Road
Fairfield, New Jersey 07004
Tel: 973-808-8550
Fax: 973-808-2923
E-mail: info@advantechcorp.com

Submittal 10/07/09

Project Title:	Site 1 Area Naval Weapons Industrial Reserve Plant; Bethpage, New York
Project Customer:	U.S. Navy NAVFAC SW RAC V
Contract No.:	N62473-07-D-3211
AdvanTech Job No:	4164
Contractor:	Tetra-Tech EC, Inc.

Enclosure

Description	Manufacturer	Part Number	Qty.
Enclosure	Saginaw	SCE-483608LP	1
Back Panel	Saginaw	SCE-48P36	1

Notes:

Approved by:_____ Date:_____

SAGINAW CONTROL & ENGINEERING

Your Enclosure Source®

Part Information - SCE-483608LP

- What's New?
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- CAD Drawings
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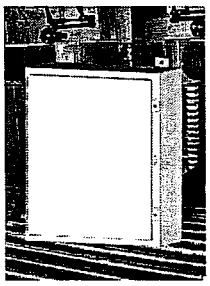
- Custom Enclosures
- Product Lines
- Installation Manual
- Technical Information
- Career Opportunities
- Search this Site
- Home

Part Details - SCE-483608LP

Printable Version

Part Number: SCE-483608LP
Description: LP Enclosure
Height: 48.00 inches
Width: 36.00 inches
Depth: 8.00 inches
Page Number: 62
List Price: $589.41
Panel: SCE-48P36
Product Code: A3
Est. Shipweight: 129.00 lbs.
NEMA Rating: 12



CAD Package (STP, PDF, DWG)

Having trouble downloading drawings? Click Here for help.

Construction -
- 0.075 In. carbon steel.
- Seams continuously welded and ground smooth, no holes or knockouts.
- Door clamps are quick and easy to operate.
- Hasp and staple for padlocking.
- Oil resistant gasket.
- Collar studs for mounting optional panels.
- Ground stud on door.
- Removable print pocket furnished if height and width of enclosure is 24 In. or more.
- Flange trough collar around all sides of door opening.
- Concealed Hinge
- Removable and interchangeable doors.

Application -
Designed to house electrical and electronic controls, instruments and components. Provides protection from dust, dirt, oil and water.

Finish -
ANSI-61 gray powder coat inside and out. Optional Subpanels are powder coated white.

Industry Standards -
NEMA Type 12, UL, CSA, TUV & IEC Approved

Similar Part Numbers -
- SCE-362406LP
- SCE-362408LP
- SCE-362410LP
- SCE-362412LP
- SCE-362416LP
- SCE-363006LP
- SCE-363008LP
- SCE-363010LP
- SCE-363012LP
- SCE-363016LP
- SCE-363020LP
- SCE-363608LP
- SCE-363612LP
- SCE-363616LP
- SCE-422408LP
- SCE-423008LP
- SCE-423010LP
- SCE-423012LP
- SCE-423016LP
- SCE-423608LP
- SCE-423610LP
- SCE-423612LP
- SCE-423616LP
- SCE-482408LP
- SCE-483008LP
- SCE-483010LP
- SCE-483016LP
- SCE-483610LP
- SCE-483612LP
- SCE-483616LP
- SCE-483620LP
- SCE-603608LP
- SCE-603610LP
- SCE-603612LP
- SCE-603616LP
- SCE-603620LP

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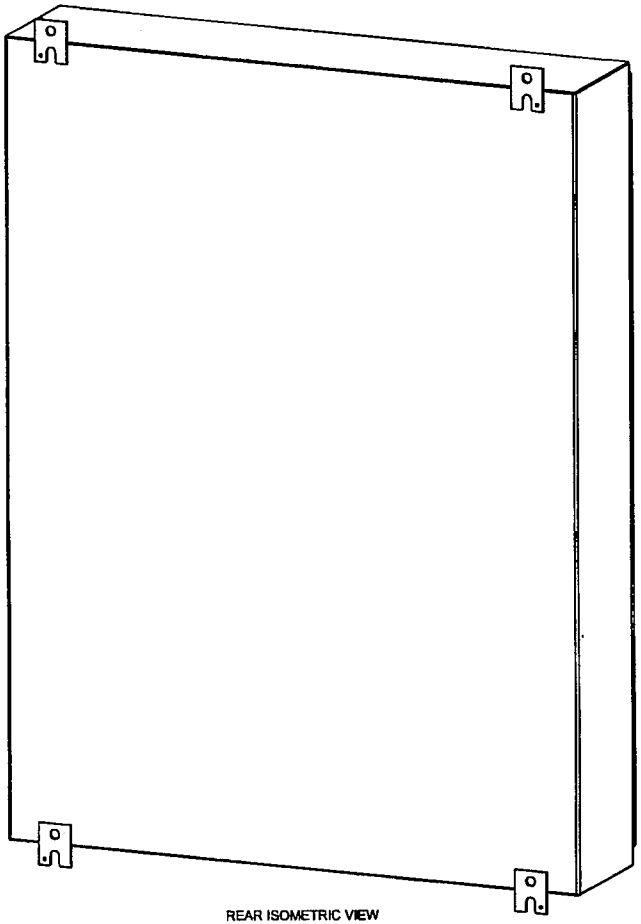
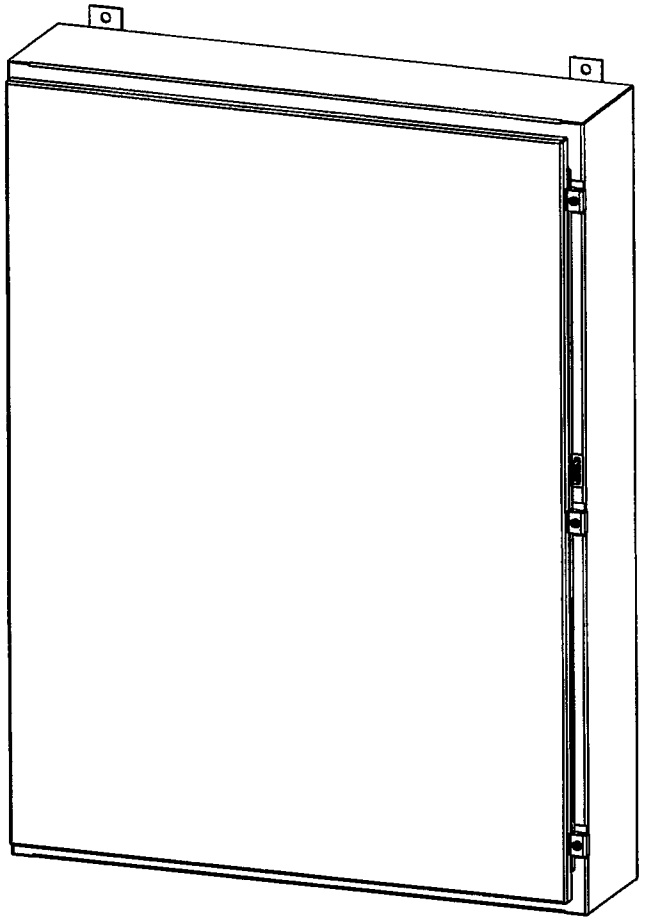


REAR ISOMETRIC VIEW



FRONT ISOMETRIC VIEW

BILL OF MATERIAL

ITEM	QTY	PART DESCRIPTION	PART I.D.
1	4	Stud, CD, Flanged Full Thread, 1/4-20 X 1/2", Steel, Copper Plated	100837
2	8	Stud, Collar, 3/8-16 X 1.72" X 1.09" X 5/8", Steel, Copper Plated	101853
3	3	Hinge Tab, Small Concealed, Steel	101886
4	4	Mounting Ear, 2.50 X 2.00 X 0.149, Steel	102207
5	3	Mounting Base, JIC Clamp, LP Style, Steel	102247
6	1	Bolt Pack, Ground Kit, 1/4-20	102287
7	1	Bolt Pack, Nut Kit, 8pcs., 3/8-16 Flanged Nuts	102360
8	3	Clamp Assembly, Sliding Clasp, LP Style, Steel, Zinc	103211
9	3	Hinge Assembly, Small Concealed, Steel	103294
10	1	Print Pocket Assembly, Large, 10.00"H x 11.50"W x 1.00"D	103308
11	1	Padlocking Hasp and Staple Assembly, LP Style, Steel	103359
12	1	Four-la-piece Gasket	119886
13	1	Enclosure Body	NA
14	1	Enclosure Bottom	NA
15	1	Enclosure Door	NA
16	1	Enclosure Top	NA

CONSTRUCTION NOTES:

1. THE ENCLOSURE IS SHOWN WITH PROVISIONS FOR AN OPTIONAL 45.00 "H x 33.00 "W SUBPANEL.
2. SLIDING DOOR CLAMPS ARE PROVIDED FOR SECURING THE DOOR.
3. A HASP AND STAPLE ARE PROVIDED FOR PADLOCKING.
4. CONCEALED HINGES WITH REMOVABLE STAINLESS STEEL PINS ARE PROVIDED ON THE DOOR.
5. MOUNTING TABS ARE PROVIDED ON THE REAR OF THE ENCLOSURE.

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PART NUMBER: SCE-483608LP	REV: –
14GA. CARBON STEEL MATERIAL UNLESS SPECIFIED	
SHEET: 1 OF 2	

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http://www.saginawcontrol.com
E-mail: sce@saginawcontrol.com

BILL OF MATERIAL

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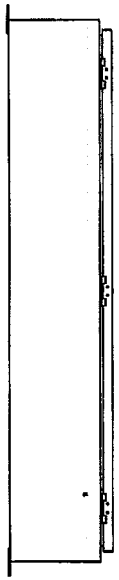
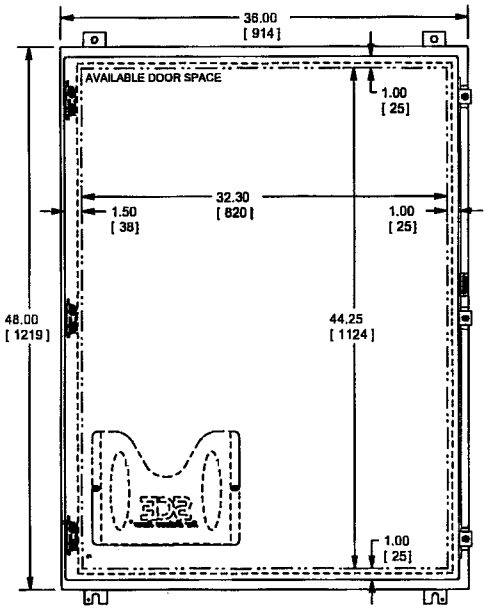
3	3	Hinge Tab, Small Concealed, Steel	101886
4	4	Mounting Ear, 2.50 X 2.00 X 0.149, Steel	102207
5	3	Mounting Base, JIC Clamp, LP Style, Steel	102247
6	1	Bolt Pack, Ground Kit, 1/4-20	102297
7	1	Bolt Pack, Nut Kit, 8pcs., 3/8-16 Flanged Nuts	102300
8	3	Clamp Assembly, Sliding Clamp, LP Style, Steel, Zinc	103211
9	3	Hinge Assembly, Small Concealed, Steel	103294
10	1	Print Pocket Assembly, Large, 10.00"H x 11.50"W x 1.00"D	103308
11	1	Padlocking Hasp and Staple Assembly, LP Style, Steel	103359
12	1	Pour-in-place Gasket	110685
13	1	Enclosure Body	NA
14	1	Enclosure Bottom	NA
15	1	Enclosure Door	NA
16	1	Enclosure Top	NA

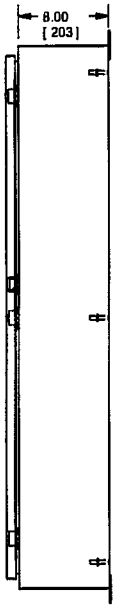
TOP VIEW



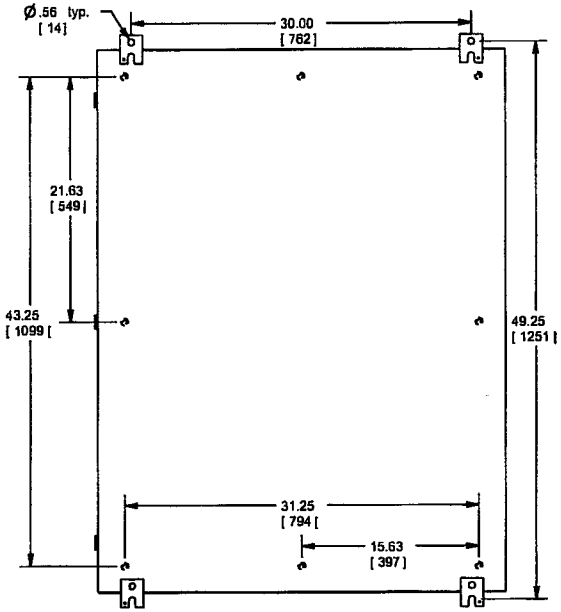
LEFT SIDE VIEW



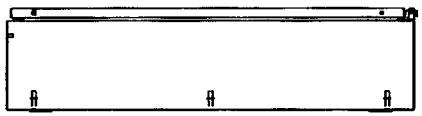
FRONT VIEW



RIGHT SIDE VIEW



REAR VIEW



BOTTOM VIEW

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PART NUMBER: SCE-463608LP	REV: –
14GA. CARBON STEEL MATERIAL UNLESS SPECIFIED	
SHEET: 2 OF 2	

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ADVANTECH CORPORATION

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Tel: 973-808-8550
Fax: 973-808-2923
E-mail: info@advantechcorp.com

Submittal 10/07/09

Project Title:	Site 1 Area Naval Weapons Industrial Reserve Plant; Bethpage, New York
Project Customer:	U.S. Navy NAVFAC SW RAC V
Contract No.:	N62473-07-D-3211
AdvanTech Job No:	4164
Contractor:	Tetra-Tech EC, Inc.

Terminal Blocks

Description	Manufacturer	Part Number	Qty.
Terminal Block	Entrelec	115 116.07	BOM
End Block	Entrelec	103 002.26	BOM
End Section	Entrelec	118 368.16	BOM
Fun End Section	Entrelec	116.951.15	BOM

Notes:

Approved by:_____ Date:_____

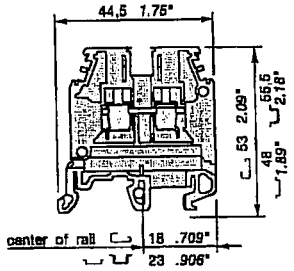
Standard terminal blocks

Compression clamp

DIN 1 - 3

M 4/6...

Spacing 6 mm + 0,05 (.238")



Standard 6 mm block 1SNA 115 116 R0700

Colour		Type	Part numbers
Standard blocks			
Grey		M 4/6	1SNA 115 116 R0700
Blue		M 4/6.N	1SNA 125 116 R0100
Orange		M 4/6	1SNA 105 002 R2000
Yellow		M 4/6	1SNA 105 116 R1600
Green		M 4/6	1SNA 105 001 R2700
Red		M 4/6	1SNA 105 032 R1500
Black		M 4/6	1SNA 105 031 R1400
White		M 4/6	1SNA 105 051 R2000
Brown		M 4/6	1SNA 105 209 R1400
Beige V0		M 4/6.V0	1SNA 195 116 R0000
Blue V0		M 4/6.N.V0	1SNA 199 002 R2600

Test connector : see section connectors

End stop	th. 9 mm	BADL	V0	1SNA 399 903 R0200
End stop	th. 9,1 mm	BAM	V2	1SNA 103 002 R2600
End stop	th. 9,1 mm	BAM V0	V0	1SNA 199 366 R0300
Rail	35 x 7,5 x 1	PR3.Z2		1SNA 174 300 R1700
Rail	35 x 15 x 2,3	PR4		1SNA 168 500 R1200
Rail	35 x 15 x 1,5	PR5		1SNA 168 700 R2200
Rail	32 x 15 x 1,5	PR1.Z2		1SNA 163 050 R0400

Other end stops, rails and accessories : see section on accessories.

Characteristics

Wire size

		IEC NFC	IEC DIN	UL	CSA
Compression clamp	Solid wire	0,2-4 mm²		22-10 AWG	22-10 AWG
	Stranded wire	0,22-4 mm²		22-10 AWG	22-10 AWG

Voltage

Rated	800 V	600 V	600 V
Pulse	8 kV		
Pollution degree	3		

Current

Rated	32 A	30 A	25 A

Wire size

Rated / Gauge	4 mm² / A4	10 AWG	10 AWG

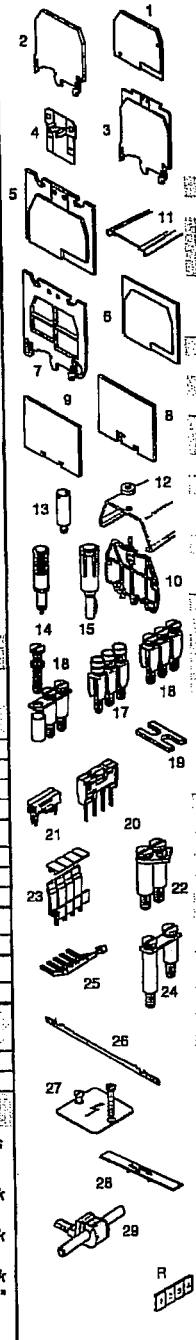
Wire strip. length	Recomm. Screwdriver	Recomm. torque	Protection
9,5 mm	4 mm	0,5-0,8 Nm	IP 20
.37"	.157"	4.4-7.1 lb.in.	NEMA 1

Notes

The use of some accessories may decrease the block's voltage rating. For more information, consult us.

BJDP1 permits the interconnection with a terminal block series "M" spacing 16 mm.
BJDP3 permits the interconnection with a terminal block series "M" spacing 12 mm.
BJDP4 permits the interconnection with a terminal block series "D" spacing 8 mm or a terminal block series "M" spacing 8 or 10 mm.

Accessories



			Type		Part numbers
1	End section	grey	FEM6	th. 2,8 mm	1SNA 118 368 R1600
		blue	FEM6	th. 2,8 mm	1SNA 128 368 R1000
		orange	FEM6	th. 2,8 mm	1SNA 103 126 R1600
		yellow	FEM6	th. 2,8 mm	1SNA 103 062 R2100
		green	FEM6	th. 2,8 mm	1SNA 103 125 R1500
		white	FEM6	th. 2,8 mm	1SNA 103 312 R2000
		beige	FEM6 V0 V0	th. 2,8 mm	1SNA 198 368 R1700
		blue	FEM6 V0 V0	th. 2,8 mm	1SNA 199 302 R0700
		yellow	FEM6 V0 V0	th. 2,8 mm	1SNA 199 305 R0200
2	End section	grey	FEM6I (3)	th. 3,0 mm	1SNA 114 776 R2300
3	End section	grey	FEM6C (3)	th. 3,0 mm	1SNA 114 777 R2400
4	Circuit separator	grey	SCM6		1SNA 113 003 R1000
		blue	SCM6		1SNA 123 003 R1200
		beige	SCM6 V0 V0		1SNA 193 003 R1100
5	Separator end section	grey	SCF6	th. 3,0 mm	1SNA 118 707 R0300
		blue	SCF6	th. 3,0 mm	1SNA 128 707 R0500
		beige	SCF6 V0 V0	th. 3,0 mm	1SNA 198 707 R0400
6	Separator end section	grey	SCF6I	th. 3,0 mm	1SNA 114 202 R2500
7	Separator end section	grey	SCFM6 (3)	th. 3,0 mm	1SNA 114 825 R0500
8	Separator end section	grey	SCFEX1 (3)	th. 2,4 mm	1SNA 103 619 R0400
9	Separator end section	grey	SCFEX3 (3)	th. 2,4 mm	1SNA 103 620 R0100
10	Separator end section	grey	SCFCV1-2 (3)	th. 3,0 mm	1SNA 116 795 R1100
	(for cover CPV)	beige	SCFCV1-2 V0 (3) V0	th. 3,0 mm	1SNA 196 795 R1200
11	Protective cover		CPM (for FEM6C, SCF6(V0) and SCFM6)		1SNA 167 312 R1400
12	Protective cover		CPV1-2 (for SCFCV1-2)		1SNA 176 816 R1200
13	Test socket		AL2 (1)	DIA. 2 mm	1SNA 163 043 R2100
			AL3 (1)	DIA. 3 mm	1SNA 163 261 R0000
14	Test device		DCJ	yellow	1SNA 173 059 R0300
15	Test plug		FC2	DIA. 2 mm	1SNA 007 865 R2600
			FC4	DIA. 4 mm	1SNA 167 860 R0100
16	Assembled jumper bar	32 A	BJM6 (1)	2 poles	1SNA 168 516 R2500
	(without IP20 protection)	32 A	BJM6 (1)	3 poles	1SNA 168 517 R2600
		32 A	BJM6 (1)	4 poles	1SNA 168 518 R0700
		32 A	BJM6 (1)	5 poles	1SNA 168 519 R0000
		32 A	BJM6 (1)	10 poles	1SNA 168 973 R0700
17	Assembled jumper bar	32 A	BJMI6 (1)	2 poles	1SNA 176 663 R0000
	(with IP20 protection)	32 A	BJMI6 (1)	3 poles	1SNA 176 664 R0100
		32 A	BJMI6 (1)	4 poles	1SNA 176 665 R0200
		32 A	BJMI6 (1)	5 poles	1SNA 176 666 R0300
		32 A	BJMI6 (1)	10 poles	1SNA 176 667 R0400
18	Jumper bar not assembled	32 A	BJS6 (1)	20 poles	1SNA 174 784 R2000
	Post + screw + washer		EV6		1SNA 168 604 R1600
19	Connector plate	35 A	EL6		1SNA 178 627 R2100
20	Screwless jumper bar	32 A	BJE6.2 (4)	2 poles	1SNA 299 694 R0400
	orange IP 20	32 A	BJE6.3 (4)	3 poles	1SNA 299 695 R0500
		32 A	BJE6.4 (4)	4 poles	1SNA 299 696 R0600
		32 A	BJE6.5 (4)	5 poles	1SNA 299 697 R0700
		32 A	BJE6.10 (4)	10 poles	1SNA 299 702 R1400
21	Jumper		BJB		1SNA 199 466 R2300
22	Pivoting jumper bar	35 A	BJP6 (1)		1SNA 174 413 R1400
23	Alternated jumper bar	35 A	BJA6 (1)	10 poles	1SNA 116 541 R1200
24	Universal jumper bar	50 A	BJDP1 (1)(2)	spacing 6 <-> spacing 16	1SNA 179 623 R0300
		70 A	BJDP3 (1)(2)	spacing 6 <-> spacing 12	1SNA 179 625 R0500
		50 A	BJDP4 (1)(2)	spacing 6 <-> spacing 8 or 10	1SNA 174 781 R2500
25	Comb-type jumper bar	35 A	PC6 (4)	2 poles	1SNA 113 546 R1400
		35 A	PC6 (4)	10 poles	1SNA 113 546 R2800
	Insulating tip		EIP		1SNA 113 550 R2400
26	Shield connector		CBM5	th. 0,5 mm	1SNA 178 745 R1400
			CBM8	th. 0,8 mm	1SNA 178 746 R1500
27	Protection label		EP6	4 blocks	1SNA 163 427 R1700
	Screw for protection label		VSP6		1SNA 163 433 R1500
28	Protection label		EPU6		1SNA 107 036 R2500
29	IDC jumper		AD2,5		1SNA 114 205 R2000
R	R See section on markers method				

Note : (1) A circuit separator SC may be required with the use of these accessories.
(2) See "Notes". (3) End sections and separators snapped on rails.
(4) See section : "Accessories" for other configurations of poles.

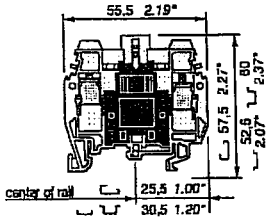
Heavy duty switch terminal blocks with push-turn knob with self-cleaning contacts

Screw clamp

DIN 1 - DIN 3

M6/8.STP.CG

Spacing 8 mm - 0,05 (.315")



Switch terminal block by a yellow push-turn knob (1/4 turn), can be sealed in the open position. Block equipped with 2 test sockets DIA. 4 mm / .16".

CE

Colour		Type	Part numbers
Grey	□	M6/8.STP.CG	1SNA 206 543 R0700
Ivory	□	ES8CG	1SNA 400 015 R2000
Green	⊡	ES8CG	1SNA 400 014 R2700

End stop		th. 9 mm²	BADI	V0 1SNA 399 902 R0200
End stop		th. 9,1 mm	BAM	V2 1SNA 103 002 R2600
End stop		th. 9,1 mm	BAM V0	V0 1SNA 199 306 R0300
Rail		35 x 7,5 x 1	PR3.Z2	1SNA 174 300 R1700
Rail		35 x 15 x 2,3	PR4	1SNA 168 500 R1200
Rail		35 x 15 x 1,5	PR5	1SNA 166 700 R2200
Rail		32 x 15 x 1,5	PR1.Z2	1SNA 163 050 R0400

Other end stops, rails and accessories: see section on accessories.

Characteristics

Wire size		IEC 947-7-1	UL	CSA
Screw clamp	Rigid	0,5-10 mm²		
	Flexible	0,5-6 mm²		

Voltage			
Rated	800 V	600 V	300 V
Impulse withstand			
Pollution degree			

Current	
Rated	32 A

Wire size			
Rated / Gauge	8 mm²	8 AWG	8 AWG

Wire stripping length	Recomm. screwdriver	Recomm. torque	Protection
11 mm .433"	4 mm .157"	0,8-1 Nm 7,1-8,9 lb.in	IP 10

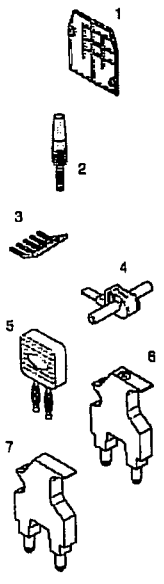
Notes

The use of some accessories may decrease the block's voltage rating. For more information, consult us.

- *Self-cleaning contacts when opening and closing.*
- *Corrosion-proof compression clamp **
- *Disturbed environment*
- *Specific for low level*

* NC screw clamps on Ivory and Green versions.

Accessories



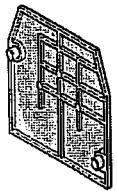
		Type		Part numbers
1 End section	grey	FEMT1	th. 2,6 mm	1SNA 113 137 R0200
	ivory	FEMT1	th. 2,8 mm	1SNA 193 137 R0300
2 Test plug		FC4	DIA. 4 mm	1SNA 167 860 R0100
3 Comb type jumper bar	50 A	PC8	2 poles	1SNA 116 538 R1700
	50 A	PC6	3 poles	1SNA 116 539 R1000
	50 A	PC8	4 poles	1SNA 116 540 R2500
	50 A	PC8	10 poles	1SNA 163 313 R2400
4 IDC jumper		AD2,5		1SNA 114 205 R2000
5 Short-circuiting plug		BP8.A4		1SNA 173 888 R2000
6 Short-circuiting plug with test socket DIA. 4 mm/.16"		BNSTP1	light ivory	1SNA 196 792 R1700
		BNSTP1	grey	1SNA 196 793 R1000
7 Short-circuiting plug without test		BNSTP2	red	1SNA 196 789 R2400
		BNSTP2	grey	1SNA 196 790 R2100
R See section on markers marking method		RC810	Sides of block	

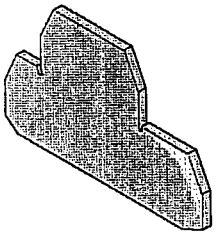
FE End sections

When assembled on the mounting track, terminal blocks cover each other's open side. At the end of an assembly, or when the size of the blocks change in an assembly, an end section must be used to isolate the open side of the block. End sections are available for all terminal blocks and are sometimes available in colors. Colored end sections can offer an easy and economical way to separate circuits for identification.

Snap-on end sections for blocks

End sections below are aligned with the profile of the block and snap on the open side of the block.





Type	Thickness	
Blocks	Color	P/N
FEM8	2,8 mm .110"	
MA 2,5/5 except D	grey	0118 368.10
M 4/6 except D and G	white	0103 312.20
M 4/8...	blue	0128 368.10
M 4/8.H and M1	yellow	0103 052.21
M 1,5/6.HH and ADV	green	0103 126.15
MTC 6	orange	0103 126.16
M 6/8 and M 10/10	black	0107 005.25
FEMS6	3 mm .118"	
MS 4/6...	grey	0113 885.01
	blue	0123 885.03
	yellow	0103 300.11
	orange	0103 292.25
FEMS8	3 mm .118"	
MS 6/8...	grey	0114 195.06
	blue	0124 196.00
	yellow	0103 301.06
	orange	0103 302.07
FEM3A	3 mm .118"	
M 4/6.3A	grey	0116 576.15
	blue	0126 576.17
	yellow	0103 882.20
FEM4A	3 mm .118"	
M 4/6.4A	grey	0116 629.22
M 4/6.SNBT.4A	blue	0126 629.24
	yellow	0103 883.21
FEM6D	1 mm .039"	
MA 2,5/5.D	grey	0118 499.23
M 4/6.D	blue	0128 499.25
M 4/6.D2.H		
M 1,5/6.D2.HH		
M 4/6.D2.M		
FEM61D	3 mm .118"	
M 4/6.D2.G and 2G	grey	0114 815.03
FEM62	3 mm .118"	
M 4/6.SB	grey	0114 994.07
M 4/6.SNB	orange	0103 612.26
FEM62D	3 mm .118"	
MS 4/6.D2.2G	grey	0114 429.10
FEM6G	2,5 mm .098"	
M 2,5/6.2G	grey	0113 027.07
M 4/6.G and 2G	blue	0123 027.01
FEM8	3 mm .118"	
M 6/8.S and SB	grey	0113 373.26
M 6/8.SN	orange	0103 230.02
FEM8D2S	1,5 mm .059"	
M 4/8.D2.SF	grey	0116 913.07
FEM8S	1,5 mm .059"	
M 4/8.SF	grey	0116 951.15
M 4/8.SN	orange	0103 923.15
M 4/8		
FEM9	3 mm .118"	
M 6/9.EE	grey	0113 057.17
FEM12	3 mm .118"	
M 16/12	grey	0116 618.01
	blue	0128 616.03
	yellow	0103 065.24

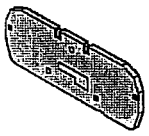
Type	Thickness	
Blocks	Color	P/N
FEM12F	3 mm .118"	
M 6/12.FF	white	0114 023.04
FEM12N	1 mm .039"	
M 16/12.NT	blue	0128 616.21
FEM12S	3 mm .118"	
MB 10/12.SF	grey	0117 628.22
FEM13U	1,5 mm .059"	
ML 10/13.SF	black	0199 835.24
ML 10/13.SN		
MU 10/13.SF		
FEM13F	1 mm .039"	
M 6/13.FF	grey	0116 977.17
FEM16	3 mm .118"	
M 35/16	grey	0118 233.27
	blue	0128 233.21
	yellow	0103 061.20
FEM22	3 mm .118"	
M 70/22	grey	0113 065.16
	yellow	0103 881.14
FEM6	1,5 mm .059"	
M 4/6.3G	grey	0114 144.12
M 4/6,5.3G		
M 2,5/6.4G		
M 2,5/6,5.4G		
FEMR10	2,5 mm .098"	
M 10/10.RS	grey	0114 434.05
FEMT1	2,8 mm .110"	
M 6/8.STP	grey	0113 137.02
FEMT2	1 mm .039"	
M 6/8.ST	grey	0113 629.27
FEMT3	2,5 mm .098"	
M 4/6.ST	grey	0114 328.22
FEMT4	3 mm .118"	
M 6/8.STA	grey	0114 778.06
FEMSTA	3 mm .118"	
M 6/8.STA	grey	0116 979.21
FEMR8	2,8 mm .110"	
M 6/8.RS	grey	0116 987.02
FEMR8T	2,8 mm .110"	
M 6/8.STP.RS	grey	0116 991.06
FEM8D1	1 mm .039"	
M 6/8.D...	grey	0116 656.25
FEM8D2	4 mm .157"	
M 6/8.D...	grey	0116 657.26
FEM12N	1 mm .039"	
M 16/12.NT	blue	0128 616.21
FEMS6D	1 mm .039"	
M 4/6.D2.SNBT	grey	0116 591.05
FEMT5	2,5 mm .098"	
M 10/10.St.Sn	grey	0116 781.13
FED3E	3 mm .118"	
D 2,5/6.D	grey	0116 771.20
FED6	1 mm .039"	
D 4/6...	grey	0116 964.12
FEDA8	1 mm .039"	
D 4/6.A...	grey	0116 965.13

End sections V0

Type	Thickness	
Blocks	Color	P/N
FEM3AP V0	3 mm .118"	
M 4/6.3A.P V0	yellow	0199 876.26
FEM4AP V0	3 mm .118"	
M 4/6.4A.P V0	yellow	0199 879.01
FEM6 V0	2,5 mm .098"	
M 4/6 V0	beige	0198 368.17
M 6/8 V0	blue	0199 302.07
M 10/10 V0	yellow	0199 305.02
MA 2,5/5 V0		
FEM3A V0	3 mm .118"	
M 4/6.3A V0	beige	0196 576.16
FEM4A V0	3 mm .118"	
M 4/6.4A V0	beige	0196 629.23
M 4/6.SNBT.4A V0		
FEM62 V0	3 mm .118"	
M 4/6.SB V0	beige	0194 994.00
FEM6D V0	1 mm .039"	
M 4/6.D V0	beige	0198 499.24
MA 2,5/5.D2 V0		
FEM6G V0	2,5 mm .098"	
M 2,5/6.2G.2G V0	beige	0193 027.00
M 4/6.2G V0		
FEM8 V0	3 mm .118"	
M 6/8.S V0	beige	0193 373.27
M 6/8.SN V0		
FEMT3 V0	2,5 mm .098"	
M 4/8.ST	beige	0194 328.23
FEM8D2S V0		
M 4/8.D2.SF	beige	0196 913.00
FEMR8 V0	2,8 mm .110"	
M 6/8.RS V0	beige	0196 987.03
FEMR8T V0	2,8 mm .110"	
M 6/8.STP.RS V0	beige	0198 991.07
FEMR10 V0		
M 10/10.RS V0	beige	0194 434.06
FEM8S V0	1,5 mm .059"	
M 4/6.SF V0	beige	0196 951.16
M 4/6.SN V0		
FEM12 V0	3 mm .118"	
M 16/12 V0	beige	0198 618.02
M 16/12.N V0	blue	0199 303.00
FEM12F V0	3 mm .118"	
M 6/12.FF V0	beige	0114 023.04
FEM13F V0	1 mm .039"	
M 6/13.FF V0	beige	0196 977.17
FEM16 V0	3 mm .118"	
M 35/16 V0	beige	0198 233.20
M 35/16.N V0	blue	0199 304.01
FEM22 V0	3 mm .118"	
M 70/22 V0	beige	0193 065.16
FEMT2 V0	1 mm .039"	
M 6/8.ST V0	beige	0193 629.20
FEMS6 V0	3 mm .118"	
MS 4/6	beige	0193 885.02
FEM8D1 V0	1 mm .039"	
M 6/8.D2	beige	0196 656.26
FEMT6 V0	2,5 mm .098"	
M 10/10 ST.Sn	beige	0196 781.14

Specific end sections for A.D.O. terminal blocks

Type	Thickness	
Blocks	Color	P/N
FEDAD1	3 mm .118"	
D 2,5/5...ADO	grey	0199 336.20
D 4/6...ADO	yellow	0199 339.03
D 6/8...ADO		
D 6/8...ADO3		
FEDAD4	2 mm .079"	
D 4/6.S...ADO	grey	0199 352.00
D 4/8.S...ADO		
FEDAD5	2 mm .079"	
D 1,5/6.S...ADO	grey	0199 354.02
D 2,5/6.S...ADO		
FEDAD6	1,5 mm .059"	
D 4/8.SF...ADO...	grey	0199 356.04
D 4/8.SNN...ADO...		
FEDAD7	1,5 mm .059"	
D 1,5/6.S...ADO	grey	0199 382.27
D 2,5/6.S...ADO2		
FEMAD3	3 mm .118"	
D 1/6...ADO	grey	0199 341.05
D 1,5/6...ADO	yellow	0199 343.07
D 2,5/6...ADO		
D 4/6...ADO		
FED2AD1	5 mm .196"	
D 4/6.D2.ADO	grey	0199 417.12
D 4/6.D2.ADO.1		
FED2AD2	5 mm .196"	
D 1,5/6.D2.ADO	grey	0199 476.25



Specific end sections for spring connection terminal blocks

FED1.L V0	1,5 mm .059"	
DR 2,5/5...2L	grey	0291 301.02
DR 2,5/10...4L	orange	0291 302.03
DS 2,5/5...2L		
DS 2,5/10...4L		
FED5.2L V0	2,5 mm .098"	
D 2,5/5...2L	grey	0291 061.24
D 4/6...2L	orange	0291 062.25
FED5.3L V0	2,5 mm .098"	
D 2,5/5...3L	grey	0291 051.22
	orange	0291 052.23
FED5.4L V0	2,5 mm .098"	
D 2,5/5...4L	grey	0291 041.20
D 2,5/5.2L.2L	orange	0291 042.21
FED8.2L V0	2,5 mm .098"	
D 6/8...2L	grey	0291 161.25
	orange	0291 162.26
FED8SF.2L V0	3 mm .118"	
D 2,5/8.S...2L	grey	0291 131.17
	orange	0291 132.10

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Submittal 10/07/09

Project Title:	Site 1 Area Naval Weapons Industrial Reserve Plant; Bethpage, New York
Project Customer:	U.S. Navy NAVFAC SW RAC V
Contract No.:	N62473-07-D-3211
AdvanTech Job No:	4164
Contractor:	Tetra-Tech EC, Inc.

Door Devices

Description	Manufacturer	Part Number	Qty.
Red Pilot Light, Push to test	Square D	9001SKT7R31	3
Amber Pilot Light, Push to test	Square D	9001SKT7A31	4
Push Button, Black	Square D	9001SKR1BH5	1

Notes:

Approved by:_____ Date:_____

Product Data Sheet

9001SKT7R31

Pilot Light , Push-To-Test, Type: K, Size: 30mm

List Price $197.00 USD

Availability **Non-Stock Item: This item is not normally stocked in our distribution facility.**

Technical Characteristics

Approvals	UL File Number E42259 CCN NKCR - CSA File Number LR24590 Class 3211-03 - CE Marked
Bezel Material	Black Plastic
Enclosure Type	Water tight, Dust tight, Oil tight and Corrosion Resistant (Indoor/Outdoor)
Enclosure Rating	NEMA 1/2/3/3R/4/4X/6/12/13
Head Type	Round
Lens Type	Plastic (Fresnel)
Lens Color	Red
Light Module Supply Voltage	220/240VAC@50/60Hz
Light Module Type	Transformer
Operator Type	Push-To-Test
Size	30mm
Terminal Type	Screw Clamp
Type	K

Shipping and Ordering

Category	21429 - Push Buttons, Corrosion Resistant, Type SK & SKY
Discount Schedule	CP1
GTIN	00785901348085
Package Quantity	1
Weight	0.5 lbs.
Availability Code	Non-Stock Item: This item is not normally stocked in our distribution facility.
Returnability	Y
Country of Origin	MX

As standards, specifications, and designs change from time to time, please ask for confirmation of the information given in this document.

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Product Data Sheet

9001SKT7A31

Pilot Light , Push-To-Test, Type: K, Size: 30mm

List Price $197.00 USD

Availability **Non-Stock Item: This item is not normally stocked in our distribution facility.**

Technical Characteristics

Approvals	UL File Number E42259 CCN NKCR - CSA File Number LR24590 Class 3211-03 - CE Marked
Bezel Material	Black Plastic
Enclosure Type	Water tight, Dust tight, Oil tight and Corrosion Resistant (Indoor/Outdoor)
Enclosure Rating	NEMA 1/2/3/3R/4/4X/6/12/13
Head Type	Round
Lens Type	Plastic (Fresnel)
Lens Color	Amber
Light Module Supply Voltage	220/240VAC@50/60Hz
Light Module Type	Transformer
Operator Type	Push-To-Test
Size	30mm
Terminal Type	Screw Clamp
Type	K

Shipping and Ordering

Category	21429 - Push Buttons, Corrosion Resistant, Type SK & SKY
Discount Schedule	CP1
GTIN	00785901348078
Package Quantity	1
Weight	0.5 lbs.
Availability Code	Non-Stock Item: This item is not normally stocked in our distribution facility.
Returnability	Y
Country of Origin	MX

As standards, specifications, and designs change from time to time, please ask for confirmation of the information given in this document.

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Product Data Sheet

9001SKR1BH5

Pushbutton , Non-Illuminated, Momentary, Type: K, Size: 30mm, 10A, 600V

List Price $66.00 USD

Availability **Stock Item: This item is normally stocked in our distribution facility.**

Technical Characteristics

Ampere Rating	10A
Approvals	UL File Number E42259 CCN NKCR - CSA File Number LR24590 Class 3211-03 - CE Marked
Bezel Material	Black Plastic
Button/Cap Color	Black
Button Type	Standard Pushbutton
Guard Type	Full Guard (Black Plastic)
Contact Configuration	1 NO
Contact Block Code	H5
Contact Type	Standard (Fingersafe)
Enclosure Type	Water tight, Dust tight, Oil tight and Corrosion Resistant (Indoor/Outdoor)
Enclosure Rating	NEMA 1/2/3/3R/4/4X/6/12/13
Head Type	Round
Light Module Supply Voltage	n/a
Light Module Type	n/a
Markings	None
Maximum Voltage Rating	600V
Mounting Type	Panel
Number of Operators	1
Number of Positions	2
Operator Action	Momentary
Operator Type	Non-Illuminated
Size	30mm
Terminal Type	Screw Clamp
Type	K
Utilization Category	AC15 - DC13

Shipping and Ordering

Category	21429 - Push Buttons, Corrosion Resistant, Type SK & SKY
Discount Schedule	CP1
GTIN	00785901041979
Package Quantity	1
Weight	0.15 lbs.
Availability Code	Stock Item: This item is normally stocked in our distribution facility.
Returnability	Y
Country of Origin	MX

As standards, specifications, and designs change from time to time, please ask for confirmation of the information given in this document.

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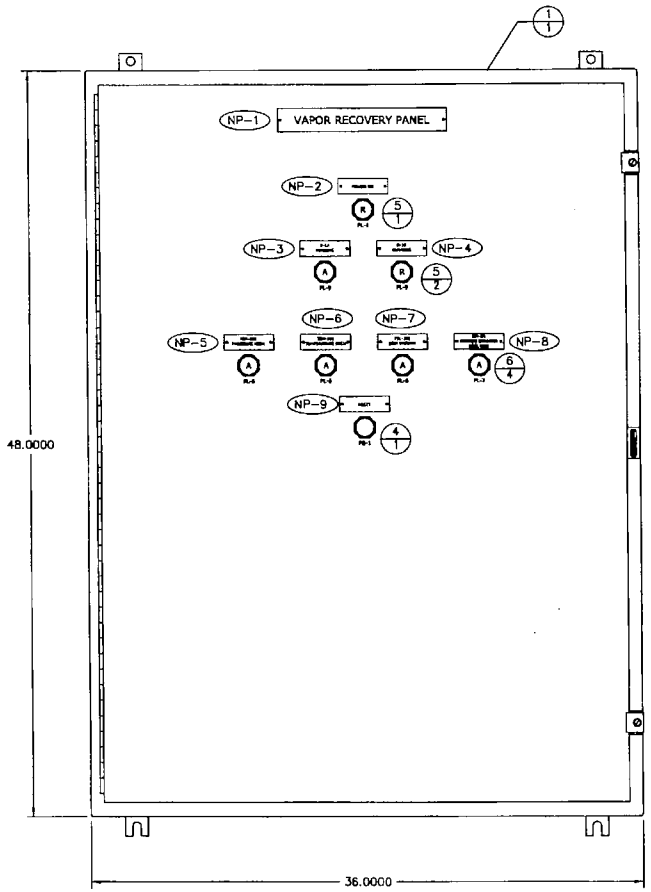
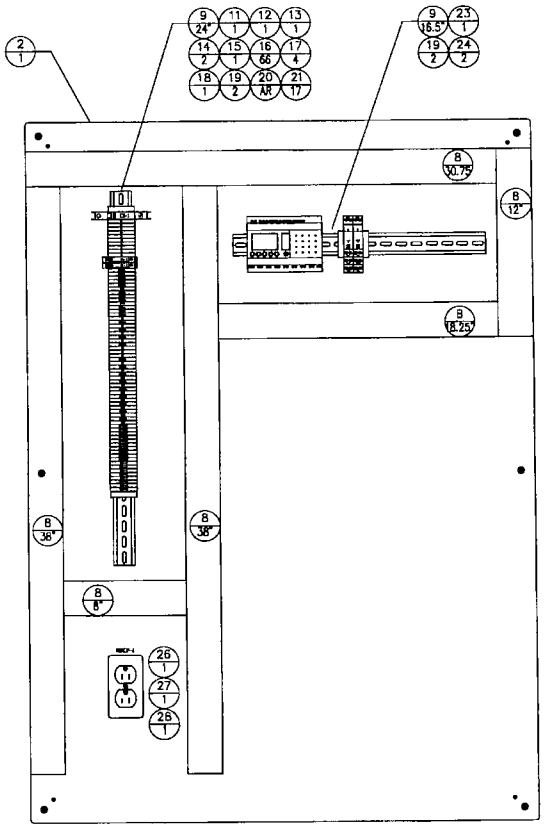


FRONT VIEW



SUB-PANEL

BILL OF MATERIALS

ITEM	QUANT	PART NUMBER	DESCRIPTION	MANUFACTURER
1	1	SCE-48360BLP	ENCLOSURE, TYPE 12, 48"Hx36"Wx8"D, SINGLE DOOR	SAGINAW
2	1	SCE-48P36	SUB-PANEL, 45"Hx33"W	SAGINAW
3				
4	1	9001-SKR1BH5	PUSH BUTTON, BLACK, 1-NO CONTACT	SQUARE D
5	3	9001-SKT7R31	PILOT LIGHT, RED LENS CAP, 120VAC	SQUARE D
6	4	9001-SKT7A31	PILOT LIGHT, AMBER LENS CAP, 120VAC	SQUARE D
7				
8	12ft	T1-2230	WIREWAY, 2.25"x3"	IBOCO
9	4ft	DIN-R 35HS1	DIN RAIL	DANNECTORS
10				
11	1	Q21130215	CIRCUIT BREAKER, SINGLE POLE, 15A, 250V	CBI
12	1	- - -	FERRULE FUSE, 250V, 5 A, 5mm-20mm	- - -
13	1	- - -	FERRULE FUSE, 250V, 2 A, 5mm-20mm	- - -
14	2	115 857.25	FUSE TERMINAL BLOCK, GREY, TYPE M 4/8.SF	ENTRELEC
15	1	116 951.15	FUSE TERMINAL BLOCK END SECTION, TYPE FEM8S	ENTRELEC
16	66	115 116.07	TERMINAL BLOCK, TYPE M-4/6	ENTRELEC
17	4	165 275.00	TERMINAL BLOCK, ISOLATED GROUND, YEL/GRN, TYPE M 4/SPI	ENTRELEC
18	1	118 368.16	END SECTION, TYPE FEM6	ENTRELEC
19	4	103 002.26	END STOP, TYPE BAM	ENTRELEC
20	3	174 784.20	JUMPER BAR, 20 POLES, UNASSEMBLED, TYPE BJS6	ENTRELEC
21	17	168 604.16	JUMPER SUBASSEMBLY, TYPE EV6	ENTRELEC
22				
23	1	SR3 B261FU	ZELIO LOGIC SMART RELAY	TELEMECANIQUE
24	2	8533771001	RELAY, DPDT, 120V AC COIL	WEIDMULLER
25				
26	1	5252	RECEPTACLE, DUPLEX, 120V AC, 15A	HUBBELL
27	1	2510	COVER, DUPLEX RECEPTACLE	APPLETON
28	1	58361 1/2-SC	UTILITY BOX, HANDI BOX, 1/2in KNOCKOUTS	STEEL CITY
29				

NAMEPLATE SCHEDULE (WHITE/BLACK LETTER W/SCREW HOLES)

NP-X	SIZE (HxW)	LETTER SIZE	LINE 1	LINE 2
1	1.5 x 11	0.50	VAPOR RECOVERY PANEL	
2	1 x 3.25	0.188	POWER ON	
3	1 x 3.25	0.188	B-1A	RUNNING
4	1 x 3.25	0.188	B-1B	RUNNING
5	1 x 3.25	0.188	PSH-101	PRESSURE HIGH
6	1 x 3.25	0.188	TSH-101	TEMPERATURE HIGH
7	1 x 3.25	0.188	PSL-101	LOW VACUUM
8	1 x 3.25	0.188	LSH-101 / MOISTURE SEPARATOR	/ LEVEL HIGH
9	1 x 3.25	0.188	RESET	

DRAWN BY: Rose Lo DATE: 10-7-09
CHECKED BY: DATE:

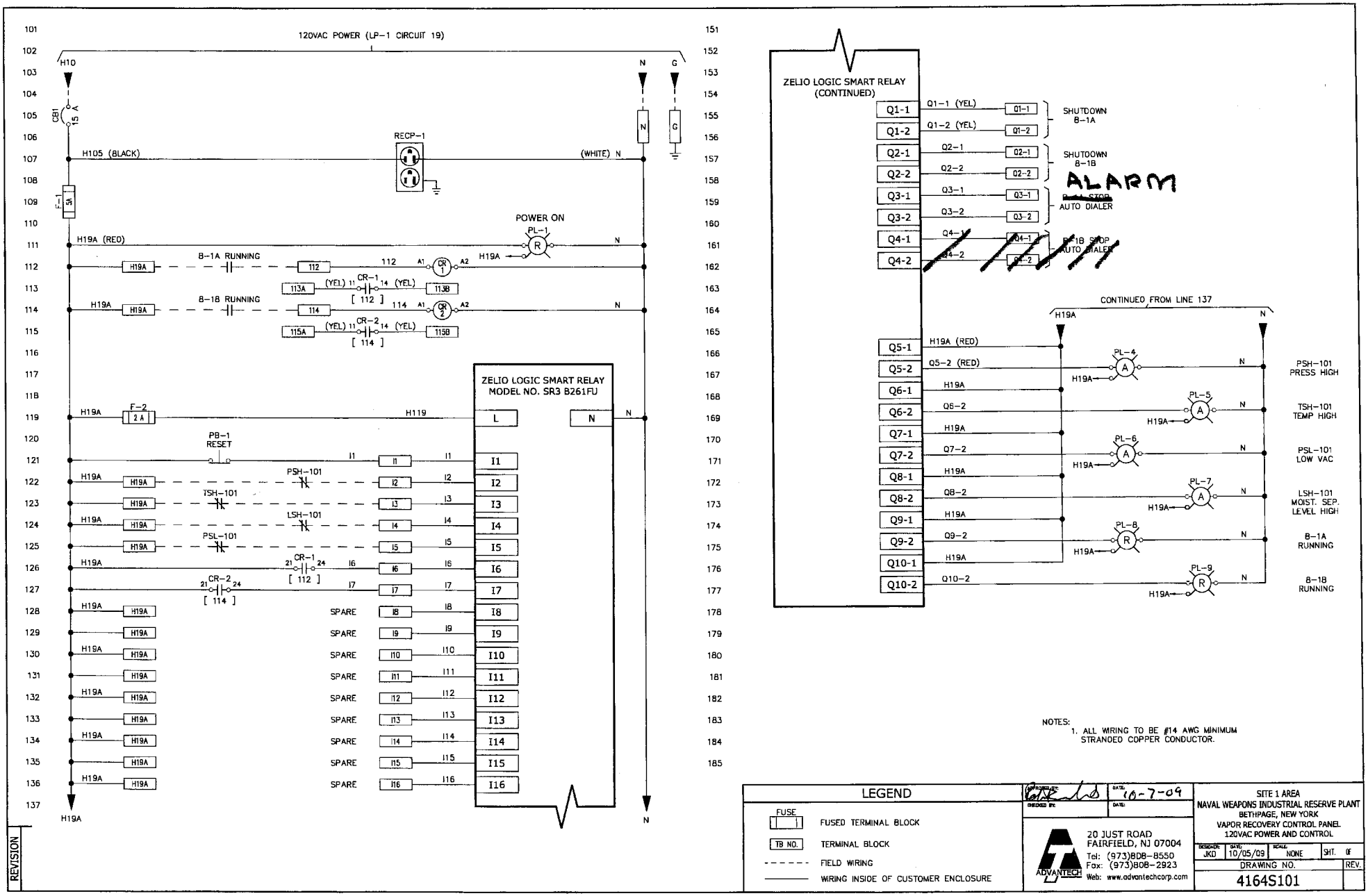
ADVANTECH
20 JUST ROAD
FAIRFIELD, NJ 07004
Tel: (973)808-8550
Fax: (973)808-2923
Web: www.advantechcorp.com

SITE 1 AREA
NAVAL WEAPONS INDUSTRIAL RESERVE PLANT
BETHPAGE, NEW YORK
VAPOR RECOVERY CONTROL PANEL
DOOR & SUB-PANEL LAYOUT

DESIGN	DATE	SCALE	SHT. 1 OF 1
JKD	10/05/09	1/4 SCALE	

DRAWING NO. 4164C101 REV.

REVISION



NOTES:
1. ALL WIRING TO BE #14 AWG MINIMUM STRANDED COPPER CONDUCTOR.

REVISION

LEGEND

FUSE	FUSED TERMINAL BLOCK
TB NO.	TERMINAL BLOCK
- - - - - -	FIELD WIRING
———	WIRING INSIDE OF CUSTOMER ENCLOSURE

APPROVED BY: DATE: 10-7-09
CHECKED BY: DATE:

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SITE 1 AREA
NAVAL WEAPONS INDUSTRIAL RESERVE PLANT
BETHPAGE, NEW YORK
VAPOR RECOVERY CONTROL PANEL
120VAC POWER AND CONTROL

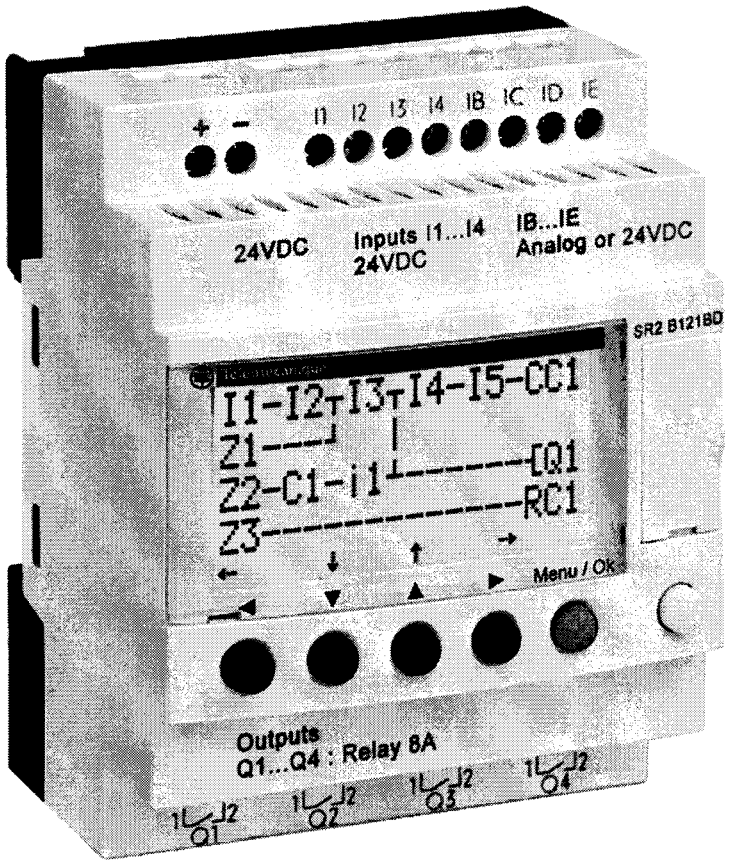
DESIGNER	DATE	SCALE	SHT.	OF
JKD	10/05/09	NONE		

DRAWING NO. 4164S101 REV.

Zelio Logic 2
Smart Relay
User Manual

SR2MAN01

11/2007



Merlin Gerin
Square D
Telemecanique

Schneider Electric

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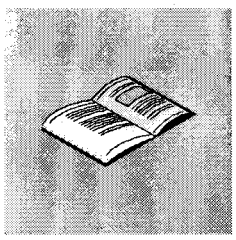

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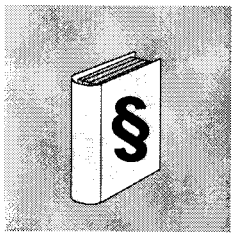

Important Information

NOTICE

Read these instructions carefully, and look at the equipment to become familiar with the device before trying to install, operate, or maintain it. The following special messages may appear throughout this documentation or on the equipment to warn of potential hazards or to call attention to information that clarifies or simplifies a procedure.

The addition of this symbol to a Danger or Warning safety label indicates that an electrical hazard exists, which will result in personal injury if the instructions are not followed.

This is the safety alert symbol. It is used to alert you to potential personal injury hazards. Obey all safety messages that follow this symbol to avoid possible injury or death.

⚠ DANGER

DANGER indicates an imminently hazardous situation, which, if not avoided, **will result** in death or serious injury.

⚠ WARNING

WARNING indicates a potentially hazardous situation, which, if not avoided, **can result** in death, serious injury, or equipment damage.

⚠ CAUTION

CAUTION indicates a potentially hazardous situation, which, if not avoided, **can result** in injury or equipment damage.

PLEASE NOTE

Electrical equipment should be installed, operated, serviced, and maintained only by qualified personnel. No responsibility is assumed by Schneider Electric for any consequences arising out of the use of this material.

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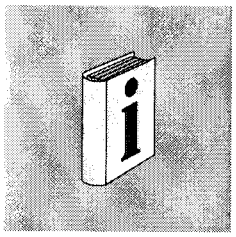
About the Book



At a Glance

Document Scope

This manual describes the use of functions accessible from the front panel of the smart relay.

This document is divided into 5 parts and addresses the following topics:

- Part I: Powering up and Discovering the Smart Relay
  - General presentation of the smart relay
- Part II: Functions Accessible from the Front Panel
  - Description of the interface and the menus of the smart relay
- Part III: LD Language
  - Description of automation functions available for programming in LADDER
- Part IV: Creating, Debugging and Saving an Application
  - Example of programming
  - Presentation of tools for debugging and saving an application
- Part V: Diagnostics
  - Help for finding solutions to operating problems

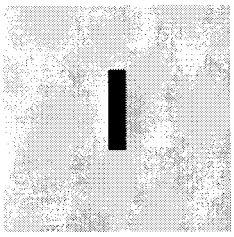
Validity Note

The information in this manual applies only to smart relays of the **Zelio 2** series.

User Comments

We welcome your comments about this document. You can reach us by e-mail at techpub@schneider-electric.com

Initial Power up and Discovering



Presentation

Subject of this Section

This section presents the operation and main characteristics of the smart relay.

What's in this Part?

This part contains the following chapters:

Chapter	Chapter Name	Page
1	Initial Power up and Discovering	13

Initial Power up and Discovering

1

Presentation

Subject of this Chapter

This chapter presents the operation and main characteristics of the smart relay.

What's in this Chapter?

This chapter contains the following topics:

Topic	Page
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Safety

Preliminary Advice

Preliminary advice and general safety precautions relating to installing smart relays:

- Remember that only qualified personnel are authorized to implement the smart relay.
- Read this instruction sheet and the User Guide to learn the procedures prior to installing, wiring, operating, maintaining of controlling the smart relay.
- The end user should keep this User Guide and the product instructions sheet.
- Install the smart relay by following the instructions in the instruction bulletin and the User Guide. Improper installation may result in failure or malfunction of the smart relay.
- Make the necessary ground and short circuit the connections.
- Check the operating conditions, as described in the User Guide. If you are unsure of the technical characteristics, contact Schneider Electric.
- Fluctuations or variations in the power supply voltage should not exceed the tolerance thresholds stated in the technical characteristics, as they may lead to operating failures and potentially dangerous situations.
- Take any steps necessary to ensure that an application interrupted by a power failure continues to operate correctly after restoring power and make sure also that no dangerous situation whatsoever arises.
- Take any steps necessary to prevent involuntary activation of the relay.
- Automation and control devices must be installed in areas where they are protected against any risk of involuntary activation.
- Ensure that all connections to the control system meet applicable safety standards.
- Ensure that you comply with all applicable standards for emergency stop systems in order to avoid potentially dangerous situations. Ensure that releasing the emergency stop system does not cause the automated system to suddenly restart.
- Install the smart relay only in environments described in the User Guide. Do not use the smart relay in environments subject to excessive temperatures, elevated relative humidity, condensation, corrosive gases, or excessive shocks.
- The smart relay should be used in "Pollution level 2" environments. This level defines the effect of pollution on the insulation.
- Definition of level 2 Pollution: Only non-conductive pollution arises, except for occasional temporary conductivity caused by condensation. Do not use smart relays in environments lower than those specified in IEC Standard 60664-1.
- Use appropriate wires according to current and voltage requirements. Tighten the screws of the terminal according to the specified torque.
- Use an IEC 60127 approved fuse, in conformity with the requirements for current and voltage, to protect the power line and output circuits. This is not required when a device including a smart relay is intended for Europe.
- Use an EU-approved switch. This is not required when a device including a smart relay is intended for Europe.

⚠ DANGER

RISK OF ELECTRIC SHOCK, EXPLOSION OR ELECTRIC ARCING

Power off the smart relay prior to installing, removing, wiring, maintaining or inspecting a smart relay system.

Failure to follow this instruction will result in death or serious injury.

⚠ WARNING

RISK OF EXPLOSION

Precautions:

- Compliant with standard CSA C22.2 No 213: This equipment is designed for use in Class 1, Division 2, Groups A, B, C, D or in non-dangerous locations only. Replacement of components may compromise the suitability to this specified environment.
- Ensure that the power voltage and its tolerances are compatible with those of the smart relay.
- Do not disconnect the equipment as long as the power supply has not been cut off or the zone is not safe.
- This product contains a battery. Do not place the smart relay in fire.

Failure to follow this instruction can result in death, serious injury, or equipment damage.

⚠ WARNING

RISK OF ELECTRIC SHOCK OR FIRE

Precautions:

- The smart relay is solely intended for installation in an enclosure. Do not install the smart relay outside of an enclosure.
- Ensure that no metal fragment or wiring material falls into the enclosure of the smart relay. Foreign bodies may lead to fire, material damage or malfunction.

Failure to follow this instruction can result in death, serious injury, or equipment damage.

⚠ WARNING

INVOLUNTARY OPERATION OF EQUIPMENT

Precautions:

- Power off the smart relay prior to installation, deinstallation, wiring, maintenance or operation of the unit.
- The emergency stop and the locking circuits should be configured in the software program of the smart relay.
- In the event of failure of the relays or transistors in the output modules of the smart relay, the outputs should remain activated or deactivated. For output signals that might lead to serious accidents, install a control circuit external to the smart relay.
- Install the modules according to the environmental operation conditions specified in the instruction bulletin.
- Do not attempt to dismantle, repair or modify the smart modules.
- Use an IEC 60127 approved fuse, in conformity with the requirements for current and voltage, to protect the power line and output circuits.

Failure to follow this instruction can result in death, serious injury, or equipment damage.

⚠ WARNING

RISK OF UNEXPECTED OPERATION

Special case of the use of the SR2COM01 modem communication extension. Sending commands may lead to modification of the status of smart relay outputs or accidental enabling of controlled equipment.

It is important to:

- Know how the commands will affect the process or the controlled equipment,
- Take any preventive measures necessary to ensure safety when making modifications.

Failure to follow this instruction can result in death, serious injury, or equipment damage.

Presentation of the Smart Relay Front Panel

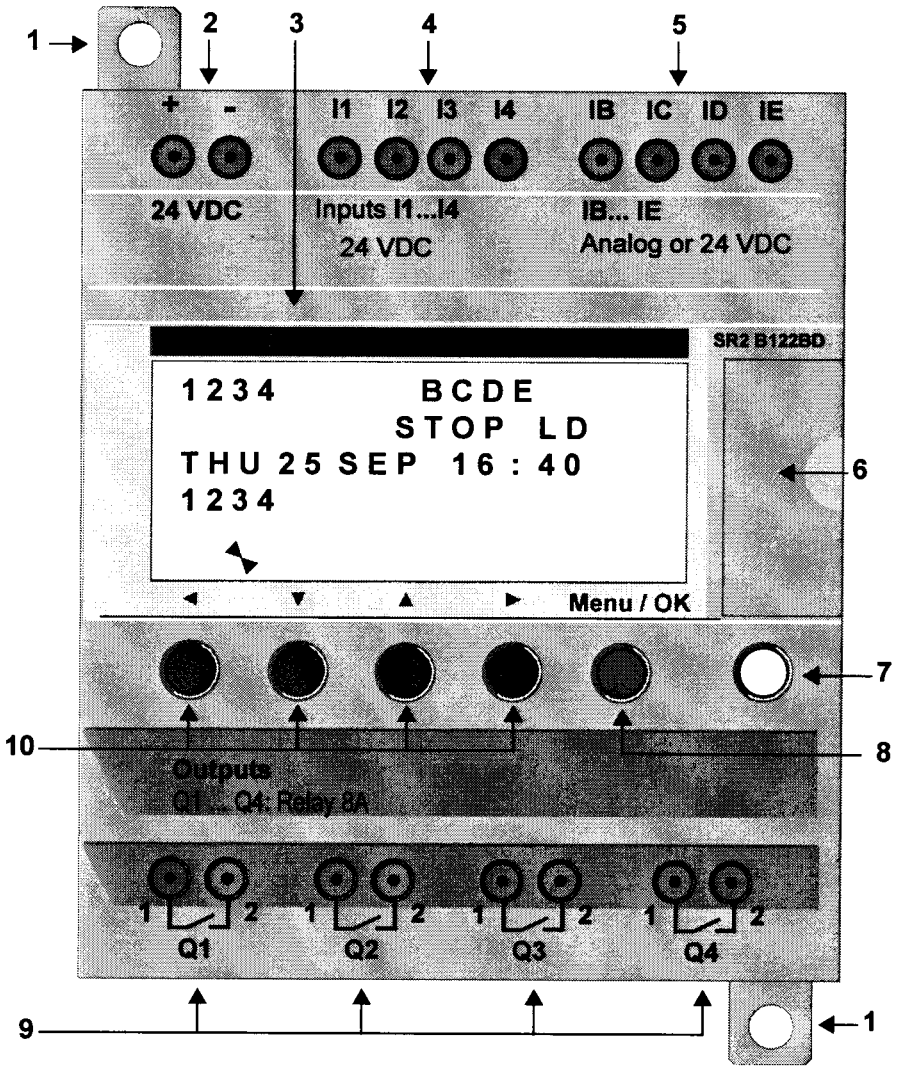
Introduction

Smart relays are designed to simplify the electrical wiring of intelligent solutions. A smart relay is very simple to implement. Its flexibility and its high performance allow users to save significant amounts of time and money.

This User's Guide is intended for people who do not have an in-depth knowledge of automation systems and who would like to be able to implement smart relays.

Description of the Smart Relay Front Panel

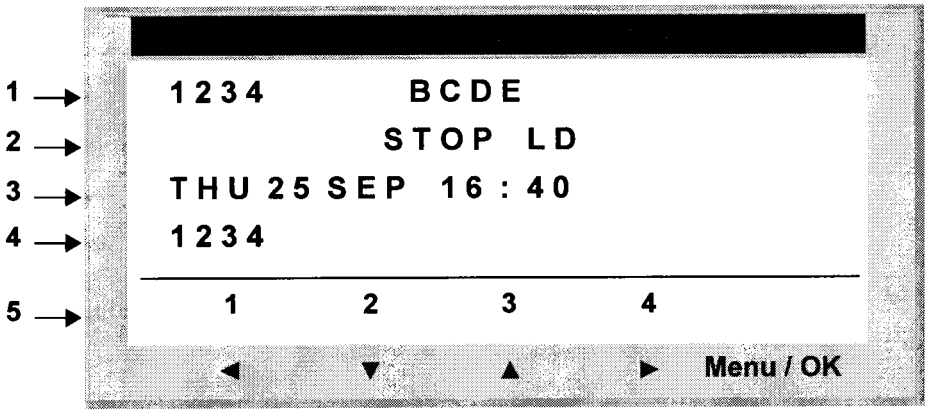
The illustration below presents the elements of the front panel of the smart relay:



Prompt	Element
1	Retractable mounting feet.
2	Screw terminal block for the power supply.
3	LCD display, 4 lines, 18 characters.
4	Screw terminal block for discrete inputs.
5	Screw terminal block for analog inputs. 0-10 Volts, usable in discrete input mode depending on model.
6	Slot for backup memory or PC connection cable.
7	**Shift** key (white).
8	**Menu/OK** key (green) for selection and confirmation.
9	Relay output screw terminal block.
10	Navigation keys (gray) or after configuring Z pushbuttons.

Description of the LCD

The illustration below presents an example of LCD display elements when displaying the INPUT-OUTPUT screen:



Prompt	Element
1	Input status* display (B...E represent the analog inputs, also may be used as DISCR).
2	Display of the operating mode (RUN/STOP) and programming mode (LD/FBD).
3	Display of the date (day and time for products with clock).
4	Output status display.
5	Contextual menus / pushbuttons / icons indicating the operating modes.

* An ACTIVE input or output is displayed in reverse video.

Characteristics and Connections

Introduction

Here is detailed information on the characteristics of DC smart relay connections.

Recommended connection

It is recommended to connect the smart relay to a regulated DC power supply:

Possible Connection

It is possible to connect the smart relay to a rectified filtered regulated power supply:

Provided that it verify the following characteristics, according to the type of smart relay:

SR2 ... BD	SR2 ... JD
U max < 30 V U min > 19.2 V	U max < 14,4 V U min > 10.4 V

Prohibited Connection

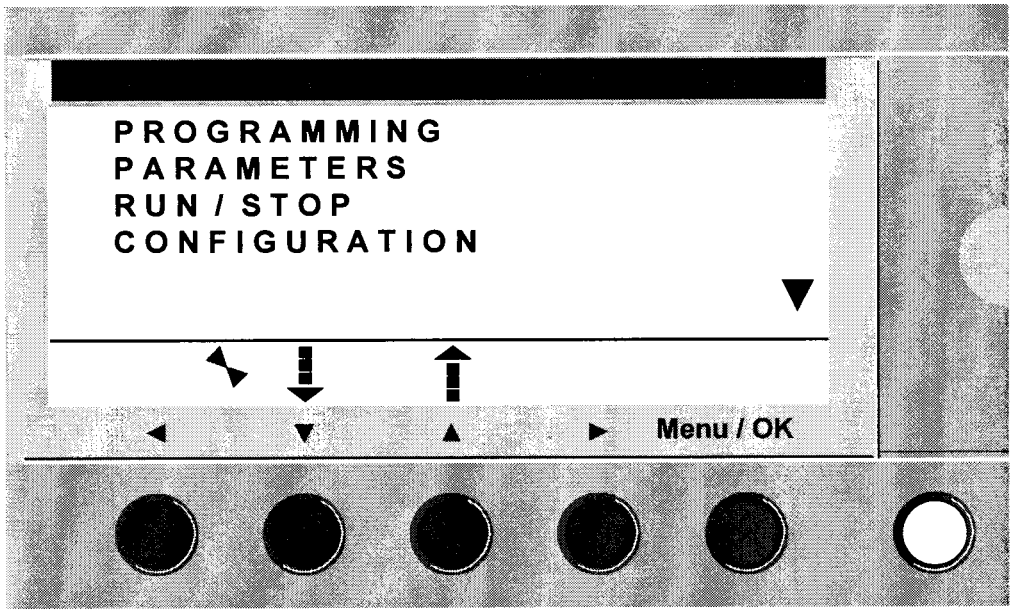
It is **prohibited** to connect the smart relay to a rectified non-filtered power supply:

Control Keys on the Front Panel of the Smart Relay

Description

The keys located on the front panel of the smart relay are used to configure, program and control the application and monitor the application's progress.

Illustration:



Note: The LCD screen is lit for 30 seconds when the user presses any of the buttons on the front panel.

Shift Key

The **Shift** key is the white key located on the right side of the LCD screen.

When the **Shift** key is pressed, a contextual menu is displayed above the Z keys (Ins, Del, Param, etc.).

Menu/OK Key

The Menu/OK key is the green key located below the LCD screen on the right side.

This key is used for all confirmations: Menu, sub-menu, program, parameter, etc.

Zx Keys

The Zx keys are the gray keys aligned from left (Z1) to right (Z4) and located under the LCD. The arrows indicating the movement direction associated with navigation are marked above the keys.

The navigation keys are used to move left or right, down or up.

The position on the screen appears as a flashing zone:

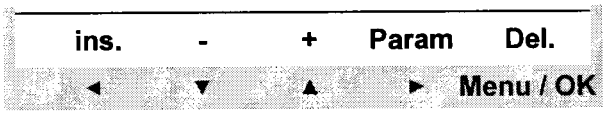
- Square for a position that corresponds to a contact (only in programming mode),
- Round for a link (only in programming mode).

Note: When the keys may be used for other actions apart from navigation, a contextual menu bar is displayed (e.g.: 1, 2, 3 and 4 as Zx-type keys).

Contextual Menus

When the cursor is placed on a modifiable parameter, if the **Shift** key is pressed, a contextual menu appears.

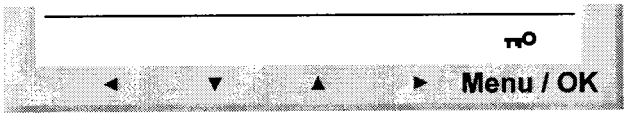
Illustration:



Using the contextual menu functions:

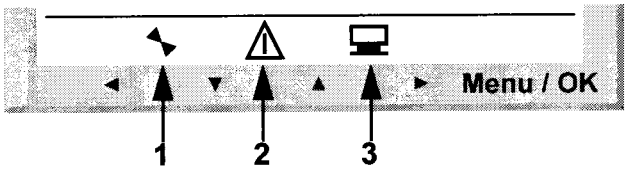
- **+ / -**: Used to scroll through the various possible values of the selected field (types of inputs, outputs, automation functions, numbers, numerical values, etc),
- **Ins.**: Inserts a line,
- **Del.**: Deletes the selected element, or the entire line if it is empty,
- **Param.**: Displays the specific parameter screen for the automation function (visible only if the automation function contains a parameter),
- ← ↑ ↓ →: Direction of the connection (visible only if the cursor is placed over a link box),
- **1 2 3 4**: This line appears when the keys are used as Zx key-type inputs in a program.

Illustration:



The key indicates that the program is password-protected.

Illustration:



1: Indicates the state of the smart relay. In RUN it is in motion, in STOP it is immobile.
2: Indicates that faults have appeared (see FAULT menu).
3: The smart relay is physically connected to the programming software.

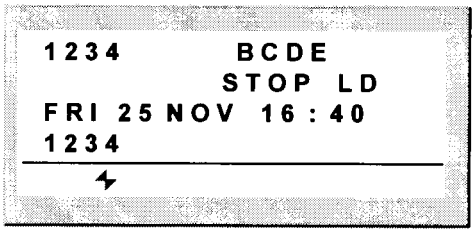
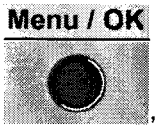
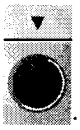
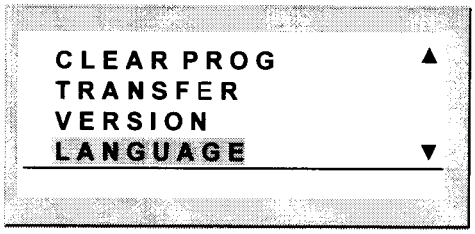
Examples

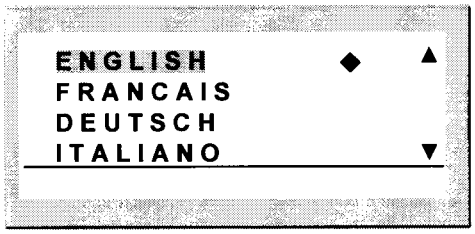
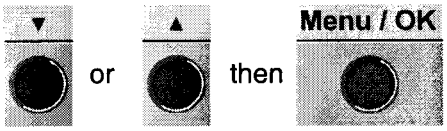
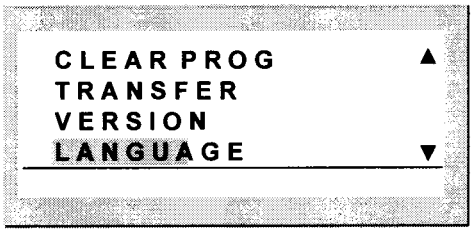
Introduction

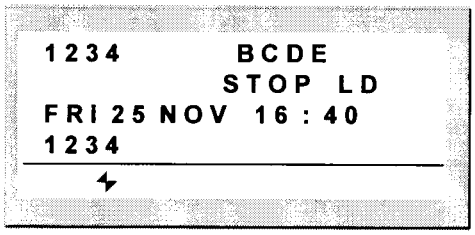
We will now see two examples of how to use the smart relay's keys.

Language Selection

Example 1: Here are details on how to select the language of the smart relay:

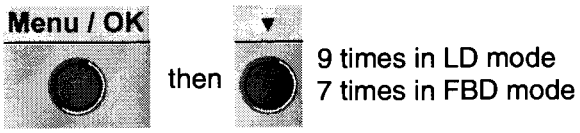
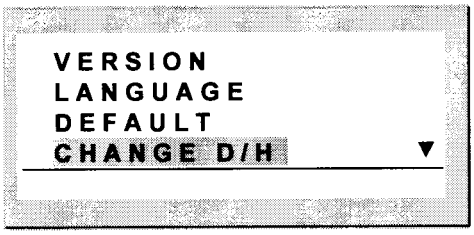
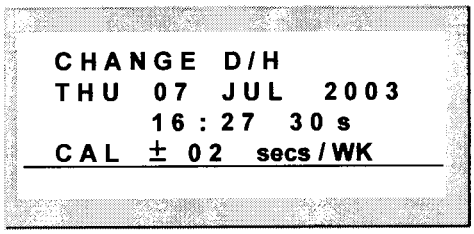
Step	Action
1	Powering up On initial powering-up, the INPUT-OUTPUT screen is displayed (See: *Inputs-Outputs Screen, p. 34*). By default, the selected language is English. **View:** 
2	From the INPUT-OUTPUT screen, enter the MAIN menu  , then go to the CONFIGURATION menu **LANGUAGE**, by pressing 7 times on the down navigation key  . **View:**  **Note**: the selected command flashes.

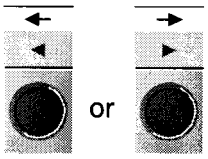
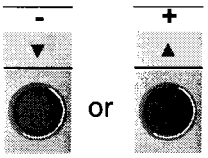
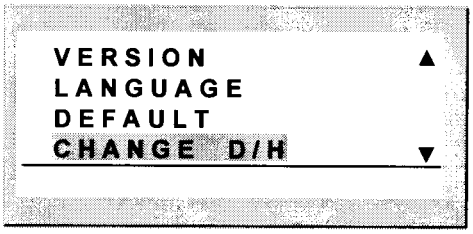
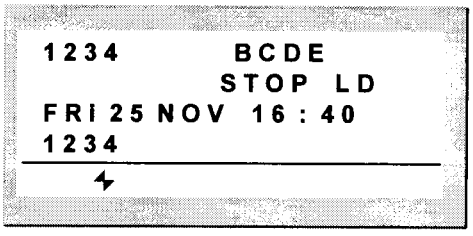
Step	Action
3	Enter in the language selection menu. **View:**  **Note**: The activated option flashes and it is also indicated by a black diamond.
4	Select and confirm the language (the selection is shown in flashing text).  The **Menu/OK** button is used to confirm the selection of the new language. The display returns to the MAIN menu when the smart relay is in STOP mode. **View:** 

Step	Action
5	Return to the INPUT-OUTPUT screen using the left navigation key. **View:** 

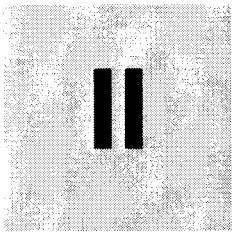
Modification of Date and Hour

Example 2: Here are details on procedure to follow to modify the date and time of the initial power up or following a long lasting power failure.

Step	Action
1	From the INPUT-OUTPUT screen, enter the **MAIN** menu, then go to the **CHANGE D/H** menu:  **View:** 
2	Enter the date and hour configuration menu: **View:** 

Step	Action
3	Select the parameter to modify using the arrows (the selection is highlighted by the blinking of the parameter):  or Modify the parameter using the navigation keys:  or Then confirm with the **Menu/OK** key: The **Menu/OK** button is used to confirm the modifications. The display returns to the MAIN menu when the smart relay is in STOP mode). **View:** 
4	Return to the INPUT-OUTPUT screen **View:** 

Functions Accessible from the Front Panel



At a Glance

Subject of this Section

This section describes the functions that can be accessed from the front panel of the smart relay.

What's in this Part?

This part contains the following chapters:

Chapter	Chapter Name	Page
2	Overview of the Functions Accessible from the Front Panel	31
3	Input/Output Screen	33
4	PROGRAMMING Menu	39
5	PARAMETERS Menu	51
6	MONITORING Menu	53
7	RUN/STOP Menu	55
8	CONFIGURATION Menu	57
9	CLEAR PROGRAM Menu	65
10	TRANSFER Menu	67
11	VERSION Menu	73
12	LANGUAGE Menu	75
13	DEFAULT Menu	77
14	CHANGE DATE/TIME Menu	81
15	CHANGE SUMMER/WINTER Menu	83

Overview of the Functions Accessible from the Front Panel

2

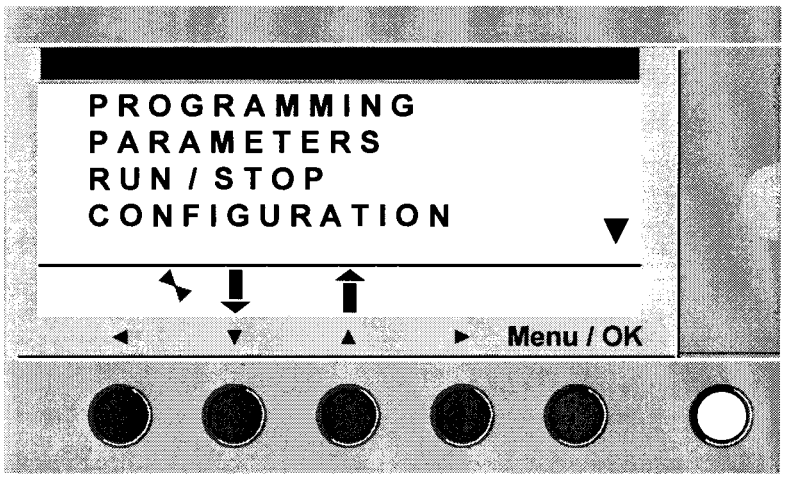
Functions Accessible from the Front Panel of the Smart Relay

Description

From the front panel of the smart relay, you may:

- Program (in LD mode),
- Configure,
- Control the application,
- Monitor the performance of the application.

Illustration:



The line flashes to indicate where you are positioned.

The up triangle ▲ on the right side of the LCD screen indicates that possible up options exist. The down triangle ▼ indicates that possible down options exist.

To return to the previous menu, press left navigation key.

Note: The LCD screen is lit for 30 seconds when the user presses any of the buttons on the front panel.

Managing Menus

The inputs-outputs screen is displayed by default whether the mode be **LD** or **FBD**.

Pressing the **Menu/OK** key switches the display from the inputs-outputs screen to the main menu.

The menu on the first row which is selected by default (flashing). The ↓ and ↑ navigation keys can be used to place the cursor over the other menus.

Press the green **Menu/OK** key to display the screen corresponding to the selected menu or to move onto the first sub-menu.

Differences Between LD and FBD Modes

Certain menus are specific to either LD or FBD mode.

Menu		LD	FBD
PROGRAMMING		✓	
MONITORING		✓	
PARAMETERS		✓	✓
RUN / STOP		✓	✓
CONFIGURATION			
	PASSWORD	✓	✓
	FILTER	✓	✓
	Zx KEYS	✓	
	WATCHDOG CYCLE	✓	✓
CLEAR PROG.		✓	
TRANSFER		✓	✓
VERSION		✓	✓
LANGUAGE		✓	✓
FAULT		✓	✓
CHANGE D/T		✓	✓
CHANGE SUMM/WINT		✓	✓

Configuring Extensions

Extensions added to the smart relay may only be configured from the programming software. See on-line help of the programming software for more information.

Input/Output Screen

3

At a Glance

Subject of this Chapter

This chapter describes the characteristics of the **input-output** screen.

What's in this Chapter?

This chapter contains the following topics:

Topic	Page
Inputs-Outputs Screen	34
TEXT and DISPLAY screen	36

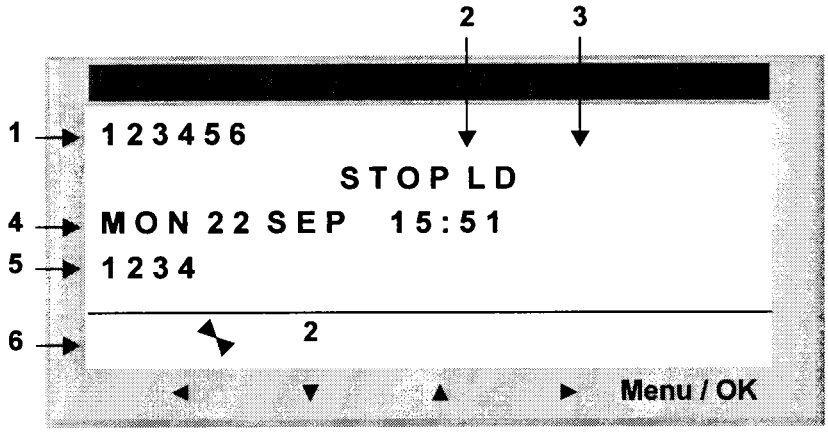
Inputs-Outputs Screen

Description

The inputs-outputs screen is the highest-level interface. It is displayed by default, when no (**TEXT** or **DISPLAY**) display function is active and regardless of:

- The programming type: **LD** or **FBD**,
- the mode: **STOP** or **RUN**.

Illustration:



The inputs-outputs screen can be used to view:

1. the state of the inputs: 1 to 9, A to P,
2. The mode used: LD/FBD,
3. The Operating mode: RUN / STOP,
4. The date and time for products with a clock,
5. the state of outputs: 1 to 9, A to G,
6. Z push buttons: 1 to 4.

In Simulation mode or Monitoring mode when the program is in **RUN**, the active states of the inputs and outputs are indicated in reverse video.

Access to the Main Menu

Pressing the **Menu/OK** key switches the display from the inputs-outputs screen to the main menu:

- PROGRAMMING (**LD** STOP mode),
- MONITORING (**LD** RUN mode),
- PARAMETERS,
- RUN / STOP,
- CONFIGURATION (STOP mode),
- CLEAR PROG. (**LD** STOP mode),
- TRANSFER (STOP mode),
- VERSION,
- LANGUAGE,
- FAULT,
- CHANGE D/T,
- CHANGE SUMM/WINT.

The display automatically returns to the inputs-outputs menu on exiting all other menus and sub-menus.

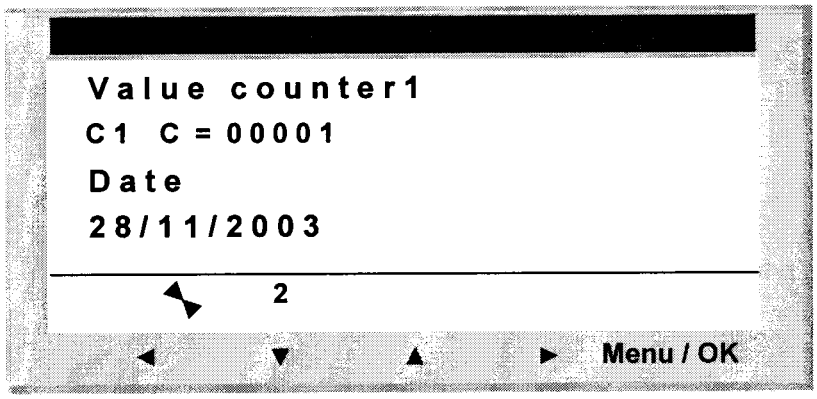
TEXT and DISPLAY screen

Description

The display functions are used to display text or numerical values (current value, preset value, etc.) on the LCD display instead of the **INPUTS-OUTPUTS**:

- In **LD** mode: A **TEXT** function is active,
- in **FBD** mode: A **DISPLAY** function is active.

Illustration:



If several display functions are active simultaneously:

- In **LD** mode: The highest block number is displayed. There are 16 TEXT-type blocks numbered from 1 to 9 then from A to G,
- In **FBD** mode: The superposition of all of the FBD DISPLAY screens is displayed, for up to 32 blocks. If more than 32 FBD DISPLAY blocks are active, the screens of the 32 FBD DISPLAY blocks with the lowest numbers are superposed.

Note: The display functions are programmable only from the programming software (see the on-line help for the programming software for more information).

Switching Between the Screens

Switching between the screens

It is however possible to go from the TEXT (LD) or DISPLAY (FBD) screen to the INPUTS-OUTPUTS screen and vice-versa.

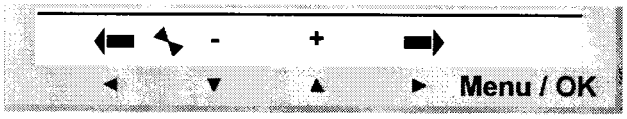
To do this, proceed as follows:

Step	Step
Action	Press and hold down the **Shift** key and press the **Menu/OK** key.

Modify Displayed Values

In **RUN** mode, when the TEXT / DISPLAY screen is displayed, it is possible to modify, from the front panel, the displayed values whose modification was authorized in the block function parameters window.

To do this, proceed as follows:

Step	Step
Action	Press the **Shift** key (white key) to display the contextual menu. **Result**: **Param** is displayed at the bottom of the screen.
2	Press the ► key (without releasing the **Shift** key) to display the contextual menu. **Result**: The parameter which can be modified flashes and the following contextual menu is displayed: 
3	Select the parameter to be modified using the navigation keys ◄ and ► from the contextual menu (the value which are available for modification flash).
4	Modify the parameter value with the + (▲) and - (▼) keys from the contextual menu.
5	Confirm the changes by pressing the **Menu/OK** key. **Result**: The display returns to the INPUTS-OUTPUTS screen or the TEXT / DISPLAY screen.

PROGRAMMING Menu

4

Presentation

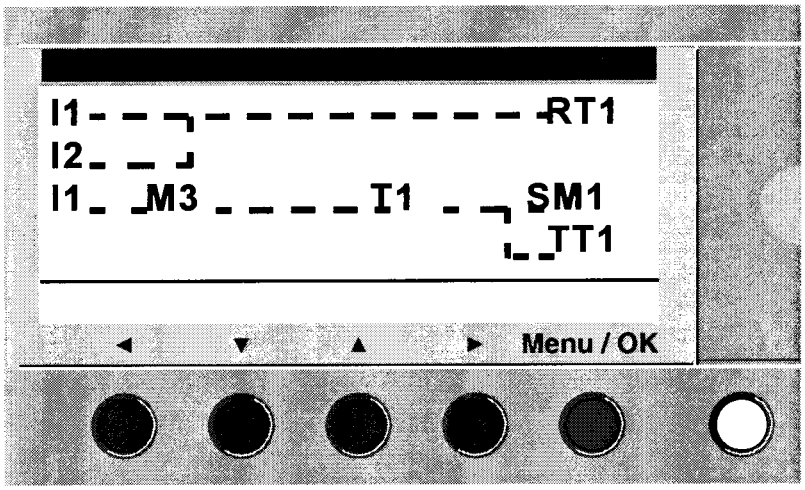
Subject of this Chapter

This chapter describes the characteristics of the **PROGRAMMING** menu specific to **LD mode** / smart relay in **STOP** mode.

This function lets the user enter the ladder diagrams that will work on the smart relay.

This program is written only using a ladder diagram LD.

Illustration:



Note: The smart relays to which have been added an Input/Output extension are programmable only in **FBD mode** from the programming software.
See on-line help of the programming software for more information.

What's in this Chapter?

This chapter contains the following topics:

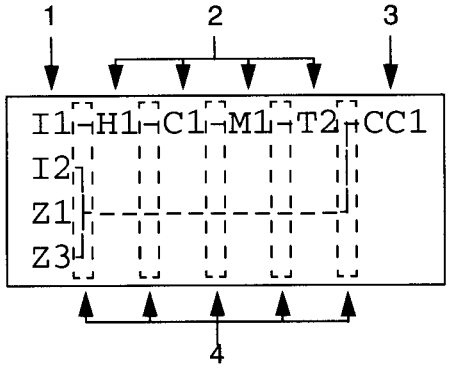
Topic	Page
Rules for Entering Ladder Diagrams	41
Method for Entering a Contact or Coil	43
Entering a Link	45
Entry of Function Block Parameters	47
Deletion and Insertion of Diagram Lines	49

Rules for Entering Ladder Diagrams

Description

A smart relay allows you to enter 120 line Ladder diagrams.

The smart relay's display screen is used to display these lines, 4 at a time, in the following manner:



Prompt	Element
1	Column reserved for contacts (conditions).
2	Column reserved for contacts (conditions) and for links.
3	Column reserved for coils (actions).
4	Column reserved for links.

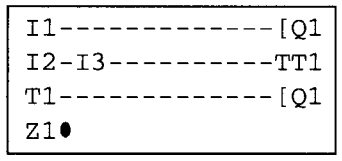
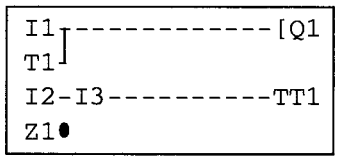
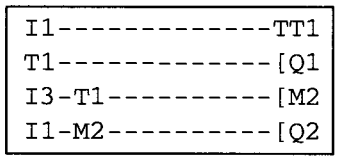
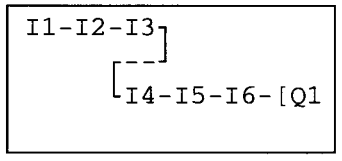
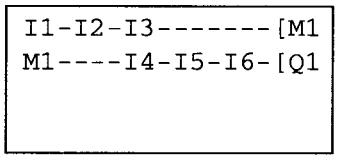
Each line comprises 5 fields each with 2 characters reserved for contacts (conditions). The 4 central columns can also accept links. The last three-character column is reserved for coils (actions).

Links must be entered between the contact and coil columns.

A ladder diagram is entered into the smart relay using the front panel keys (see *Control Keys on the Front Panel of the Smart Relay, p. 20*).

Data Entry Rules

Make sure you respect the following rules when you enter a ladder diagram:

Rules	Incorrect	Correct
Each coil must only be entered once in the right hand column		
Elements used as contacts may be entered as many times as necessary in the 5 left hand columns.		
Links must always run from left to right.		
If **S** coils (SET) are used in a diagram, also use an **R** (Reset) coil.	If no **R** (Reset) coils are used, the corresponding coil will always be set to 1.	An **R** (Reset) coil must be used for reset purposes.

Note: Smart relays run programs from top to bottom and from left to right.

Method for Entering a Contact or Coil

Description

Note: Accessible only in **LD mode** / smart relay in STOP mode.

This section describes the procedures for performing the following operations:

- Entering an element,
- Modifying an element,
- Deleting an Element.

This is valid for : contact or coil elements, whether the parameters can be set or not.

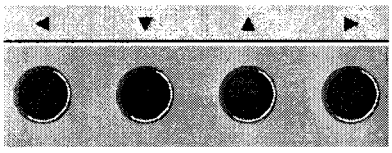
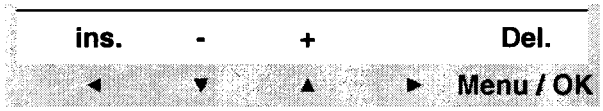
Entering an Element

When entering an element, the following rules must be observed:

- **Contact**: In any column except the last,
- **Coil**: Only in the last column.

The presence of a square, flashing cursor means an element can be inserted.

Entry procedure:

Step	Action
1	Place the flashing cursor at the required location. The navigation keys can be used move the cursor in the direction of the arrows on the navigation keys ◄ ▼ ▲ ►. Illustration: 
2	Press the **Shift** key to display the contextual menu. Illustration:  By simultaneously pressing **Shift** and one of the ▼ ▲ (- and +) keys, the first letter of the element is inserted: **I** for a contact and **Q** for a coil, followed by the number **1**.
3	Choose the type of element desired by pressing simultaneously on **Shift** and + or -. This makes the different types of elements scroll down cyclically, in the following order: • For the contacts: I, i, Z, z, M, m, Q, q, T, t, C, c, K, k, V, v, A, a, H, h, W, w, S, s. • For the coils: M, Q, T, C, K, X, L, S. See the chapter*LD Language Elements, p. 87.*

Step	Action
4	Release the **Shift** key to have access to the navigation keys: ◄ ▼ ▲ ►. Pressing the ► key places the cursor over the corresponding number **1**.
5	Simultaneously hold down the **Shift** and + keys to increment the number of the element (2, 3, 4,..., 9, A, etc.). **Note:** The numbers for functional blocks are limited to the number of blocks of the type available in the smart relay. In the case of extensible smart relays, the inputs and outputs numbers are used to program the extension to maximum size. In entering a contact, once this step is completed, the entry is terminated. In entering a coil, you must additionally select the function of the coil.
6	Release the **Shift** key to have access to the navigation keys: ◄ ▼ ▲ ►.
7	**Steps 7 to 9 are only necessary when entering a coil.** Position the cursor on the function of the coil by pressing twice on the ◄ key.
8	Select the desired function by pressing simultaneously on the **Shift** key and the + or - key. This will scroll through the different coil functions available.
9	Release the **Shift** key to have access to the navigation keys: ◄ ▼ ▲ ►.

Note: Confirming some function block coils will bring-up a function block parameter setting screen.

Modifying an element,

To modify an existing control diagram element, simply:

- Position the pointer over the element to modify: Step **1** in the previous table,
- Select the desired new element: Steps **3** to **6**.

Initialization

Status of contacts on program initialization:

- A contact in normally-open mode (direct state) is inactive,
- A contact in normally-closed mode (reverse state) is active,

Deleting an Element

To delete an element, simply:

- Place the cursor over the element to delete: Step **1**,
- Simultaneously press the **Shift** and **Menu/OK** keys.

Two scenarios are possible, depending on the position of the cursor at the time of the deletion:

- Cursor over an element: the element is deleted,
- Cursor over an empty position of the line: the whole line is deleted.

Note: Generally, the deleted element must be replaced by a link.

Entering a Link

Description

Note: Accessible only in **LD mode** / smart relay in STOP mode.

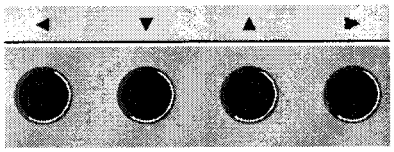
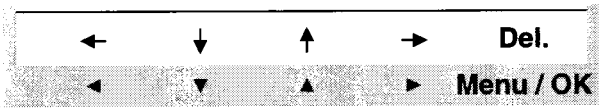
This section describes the procedures for performing the following operations:

- Entering links between elements,
- Deleting links between elements,
- Replacing a link with a contact.

Entering a Link

Links are entered exclusively using the round flashing cursor.

Entry procedure:

Step	Action
1	Place the flashing cursor at the required location. The navigation keys can be used move the cursor in the direction of the arrows on the navigation keys ◄ ▼ ▲ ►. Illustration: 
2	Press the **Shift** key to display the contextual menu. Illustration: 
3	Trace connections by simultaneously pressing the **Shift** key and the navigation keys: ← ↑ ↓ →. **Shift** and → to trace a connection to the position of the next contact or to the coil at the end of the line. **Shift** and ↑ ↓ to trace perpendicular connections to the previous or next line.
4	Release the **Shift** key to have access to the navigation keys: ◄ ▼ ▲ ►.
5	Repeat the operation as many times as necessary to link the elements together according to your requirements.

Modifying a Link

To modify an existing link, simply:

- Place the cursor over the link to modify: step **1**
- Modify the link: Steps **2** to **5**.

Deleting a Link

To delete a link, simply:

- Place the cursor over the element to delete: step **1**.
- Simultaneously press the **Shift** and **Menu/OK** keys.

Two scenarios are possible, depending on the position of the cursor at the time of the deletion:

- Cursor over a link: The link is deleted,
- Over an empty position of the line: The whole line is deleted.

Replacing a Link with a Contact

To replace a link with a contact, simply:

- Place the cursor (flashing square) over the link to transform: step **1**.
- Follow the element entry (see *Method for Entering a Contact or Coil, p. 43*) procedure: Steps **3** to **6**.

Entry of Function Block Parameters

Description

Note: Accessible only in **LD mode** / smart relay in STOP mode.

When entering a control diagram, the parameters of the configurable automation functions must be completed.

The automation functions with parameters are the following:

- Auxiliary relays (see *Auxiliary Relays, p. 93*) (latching),
- Discrete Outputs (see *Discrete (DISCR) Outputs, p. 98*) (latching),
- Clocks (see *Clocks, p. 134*),
- Analog Comparators (see *Analog Comparators, p. 129*),
- Timers (see *Timers, p. 101*),
- Counters (see *Counters, p. 111*),
- Fast counters (see *Fast Counter, p. 118*).

Accessibility of parameters

Function block parameter setting can be accessed:

- When entering the command diagram line,
- From the **PARAMETERS** menu if the block has not been padlocked.

Entering Parameters on Creation of the Block

Parameters are entered in the same way, whatever the parameters screen:

Step	Action
1	Enter the desired automation function: Step **1** of the element entry (see *Method for Entering a Contact or Coil, p. 43*) procedure. When the function has parameters, **Param** appears in the contextual menu (when the **Shift** key is pressed). Illustration: **ins. - + Param Del.** **◄ ▼ ▲ ► Menu / OK**
2	Press and hold down the **Shift** key and press on **Param** (key ►). **Result**: The function's parameter screen appears.
3	Use the navigation keys to move to the cursor over the modifiable parameters: ◄ ►.
4	Modify the value of the parameter using the + and - keys, holding down **Shift**.
5	Confirm the modifications by pressing **Menu/OK**, which will open the confirmation window. Confirm again by pressing the **Menu/OK** key to save.

Modifying the Parameters of Existing Blocks

To modify the parameters of an existing element, simply:

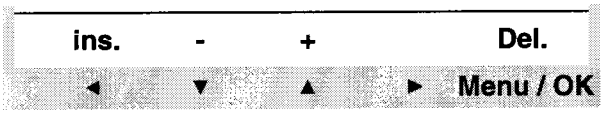
Step	Action
1	Use the navigation keys to move the cursor over the element to modify: step **1** of the element entry (see *Method for Entering a Contact or Coil, p. 43*) procedure.
2	At the same time, hold down **Shift** and the **Param** key to open the parameter window.
3	Carry out steps **3** to **5** above.

Deletion and Insertion of Diagram Lines

Deletion

Note: Accessible only in **LD mode** / smart relay in STOP mode.

Diagram lines are deleted line-by line. The procedure is the following:

Step	Action
1	Place the cursor over the line to delete.
2	Delete all the elements in the line (see *Method for Entering a Contact or Coil, p. 43*): (Links, contacts and coils) to obtain an empty line.
3	Press the **Shift** key to display the contextual menu. Illustration:  Simultaneously pressing **Shift** and **Del** opens the confirmation window.
4	Confirm by pressing **Menu/OK**.

Note: It is possible to delete all diagram lines contained in the smart relay. In order to do this, select the **CLEAR PROG.** option from the main menu, and confirm the deletion of all the control diagram lines.

Insertion

The procedure is the following:

Step	Action
1	Place the cursor over the line located immediately below the line to create.
2	Press the **Shift** key to display the contextual menu.
3	Press the **Ins** key (while holding down the **Shift** key) to create the line.

PARAMETERS Menu

5

PARAMETERS Menu

Description

This menu is used to enter and modify the application parameters directly on the screen using the smart relay keys. This function can be accessed in the two modes: **LD** and **FBD**, but the contents will be specific to the mode used.

If there are non-locked parameters to display they are listed in the window; otherwise a **NO PARAMETER** message appears.

LD mode

Functions with parameters in LD mode:

- Auxiliary relays (see *Auxiliary Relays, p. 93*) (latching),
- Discrete Outputs (see *Discrete (DISCR) Outputs, p. 98*) (latching),
- Clocks (see *Clocks, p. 134*),
- Analog Comparators (see *Analog Comparators, p. 129*),
- Timers (see *Timers, p. 101*),
- Counters (see *Counters, p. 111*),
- Fast counter (see *Fast Counter, p. 118*).

Only those functions used in the program and with parameters are listed in the **PARAMETERS** menu.

FBD mode

Functions with parameters in FBD mode:

- Numerical Constant-Type Inputs,
- Clocks,
- Gain,
- Timers: TIMER A/C, TIMER B/H, TIMER Li,
- Counters: PRESET COUNT,
- Fast counter,
- CAM block.

To access the parameters of the FBD blocks, you must know end enter the block number. This number appears in the programming software on the wiring sheet at the top right corner of the block.

Only those functions used in the program and with parameters are listed in the **PARAMETERS** menu.

Parameter Modification

Parameter modification procedure:

Step	Action
1	Place the cursor over the **PARAMETERS** menu in the main menu (PARAMETERS flashing) and confirm by pressing the **Menu/OK** button. **Result**: The parameters window opens to the first parameter.
2	Select the function to modify. To access the required function, scroll through the function block numbers (navigation keys ▼ and ▲) until you reach the right one.
3	Select the parameter to modify. The ◄ and ► keys are used to place the cursor over the parameter to modify.
4	Modify the parameter using the + and - keys (▲ and ▼) of the contextual menu.
5	Confirm the modifications by pressing **Menu/OK**, which will open the confirmation window.
6	Confirm again twice by pressing **Menu/OK** to save. **Result**: The display returns to the INPUTS-OUTPUTS screen in RUN mode and to the MAIN menu in STOP mode.

Parameters in RUN Mode

It is therefore possible to modify parameters in RUN mode dynamically as long as they are not locked.

The modifications can be made:

- From the **PARAMETERS** (see *PARAMETERS Menu, p. 51*) menu,
- From the **MONITORING** (see *MONITORING Menu, p. 53*) (LD) menu: Move the pointer over the function to be modified using the navigation keys and open the parameters window from the contextual menu (**Shift** key).

MONITORING Menu

6

MONITORING Menu

Description

Note: Accessible only in **LD mode** / smart relay in RUN mode.

MONITORING mode can be used to obtain a dynamic view of the state of the smart relay inputs/outputs.

In this mode the wiring diagram appears as it does in the PROGRAMMING (see *PROGRAMMING Menu, p. 39*) menu (smart relay in STOP mode), but appear in reverse video when inputs or outputs are activated (white on black background).

Illustration:

```
I■-i2----------[Q■
IB-------------TT1
T1-------------[Q2
H1-------------[M1
```

This mode is also used to dynamically modify the values of automation function parameters if these are not locked.

Parameter Modification

To modify the parameters, proceed as follows:

Step	Action
1	Use the navigation keys to move the cursor over the element to modify: Step **1** of the element entry (see *Method for Entering a Contact or Coil, p. 43*) procedure.
2	At the same time, hold down **Shift** and the **Param** key to open the parameter window.
3	Use the navigation keys to move to the cursor over the modifiable parameters: ◄ ►.
4	Change the parameter value using the keys + and -.
5	Confirm the modifications by pressing **Menu/OK**, which will open the confirmation window. Confirm a second time by pressing **Menu/OK** to save.
6	Confirm again with **Menu/OK**. **Result**: Return to the parameter screen.
7	Confirm again with **Menu/OK**. **Result**: Return to the LD diagram screen.

RUN/STOP Menu

7

RUN/STOP Menu

Description

This function is used to start or stop the program in the smart relay:

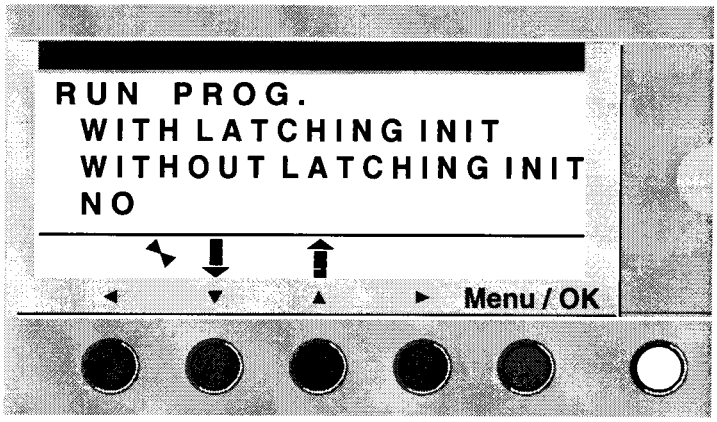
- In **STOP** mode: The program is stopped and the outputs disabled,
- In **RUN** mode (with or without initialization of latching parameters): The program is executed.

Startup

In STOP mode, when accessing the RUN/STOP menu, the interface proposes the following three choices for starting the program:

- **WITH LATCHING INIT**: All current values (counters, timers, etc.) are reset to zero before the program starts (default selection),
- **WITHOUT LATCHING INIT**: Current values for which the **Latching** option has been activated are kept,
- **NO**: The program has not been started.

Illustration:



The navigation keys ▼ ▲ are used to change the selection.

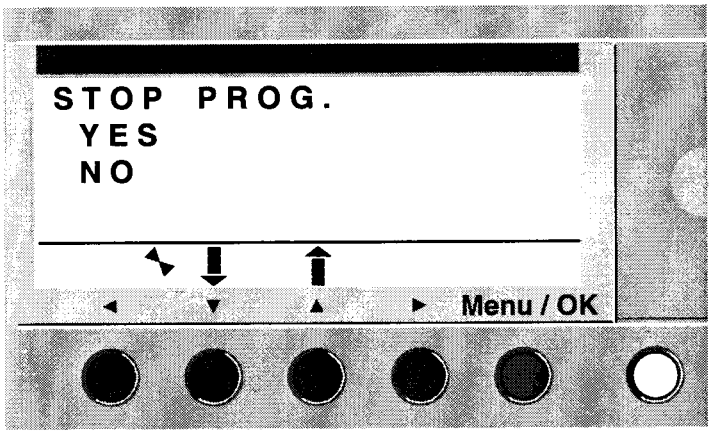
When the mode has been validated with the **Menu/OK** key, the display moves to the **INPUT-OUTPUT** screen.

Off

In RUN mode, when accessing the RUN/STOP menu, the interface asks the user to confirm the request to stop the program:

- **YES**: The program stops (selected by default),
- **NO**: The program does not stop.

Illustration:



The navigation keys ▼ ▲ are used to change the selection.

When the mode has been confirmed with the **Menu/OK** key, the display moves to the **INPUT-OUTPUT** screen.

Smart Relays Without Screen

For smart modules without screen, a green LED located on the front panel of the module is an indicator light:

- If the LED flashes slowly (3 Hz), the module is in RUN mode (even if there is non-blocking fault).
- If the LED flashes rapidly (5 Hz), the module is in STOP mode with fault.
- If the LED stays lit, the module is powered-up and in STOP mode.

Note: On power up, the smart relay is in RUN mode, unless there is a blocking fault.

Note: To release a blocking fault, power off the module, then power it up again.

CONFIGURATION Menu

8

Presentation

Subject of this Chapter

The **CONFIGURATION** menu provides access to the following 4 functions:

- PASSWORD,
- FILTER,
- Zx KEYS,
- WATCHDOG & CYCLE

This chapter describes the characteristics of these functions.

Note: Use the navigation key to return to the main menu◄.

Note: If the program is password-protected, (key displayed in the contextual menu), the user must enter the password before any action can take place in the sub-menus.

Note: The **CONFIGURATION** menu is only available in STOP mode.

What's in this Chapter?

This chapter contains the following topics:

Topic	Page
PASSWORD Menu	58
FILTER Menu	61
Zx KEYS Menu	62
WATCHDOG CYCLE Menu	63

PASSWORD Menu

Description

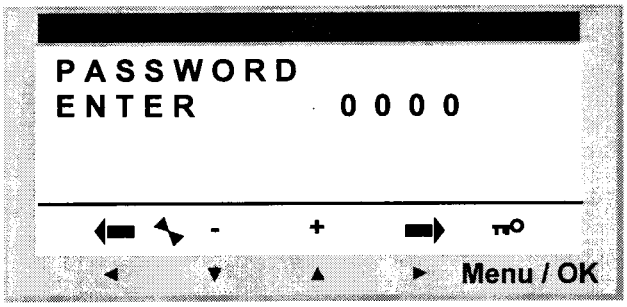
If the program is password-protected (key icon appears), the user must enter the password to perform certain operations.

The password protects access to the following menus:

- PROGRAMMING (**LD** STOP mode),
- MONITORING (**LD** RUN mode),
- CONFIGURATION (STOP mode),
- CLEAR PROG. (**LD** STOP mode),
- MODULE TRANSFER > MEM (STOP mode).
- MEM TRANSFER > MODULE (**LD** STOP mode depending on the choice of the programmer [1], FBD STOP mode).

Note: [1] The programmer can configure the application to protect access to this menu in LD mode, .

Illustration:



Activating the password also involves usage limitations in the programming software:

- Modification of the program contained in the smart relay,
- Rereading of the program contained in the smart relay,
- Destruction by transferring another program.
- Monitoring,

Note: If you lose a password, the solution is to overwrite the program from the programming software; see the on-line help of the programming software.

- Transferring/Clearing the program,
- Module/Update module Firmware, for more information about the compatibility of the firmware, see *Compatibility between the version of the programming software and the version of the firmware on the smart relay, p. 234.*

Note: It is possible to quit the screen without entering a password by using a combination of the **Shift** key (white key) and the **Menu/Ok** key (green key).

Note: To return to the main menu from the CONFIGURATION menu, use the navigation key ◄.

Entering Password

Initially, the key is not displayed and each digit is set to 0.

The **ENTER** message appears in the window.

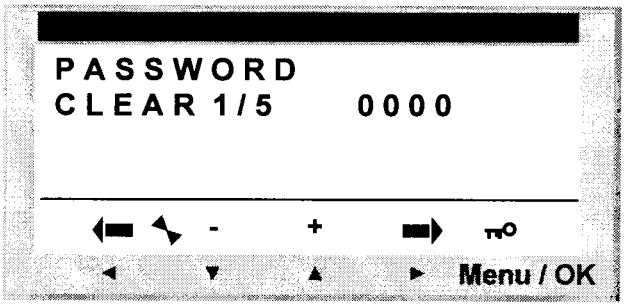
Entry procedure:

Step	Action
1	Use the navigation keys to select the digit to enter: ◄ ►.
2	Select the value of the digit using the + and - keys of the contextual menu.
3	Confirm the password with the **Menu/OK** key, which opens the confirmation window.
4	Confirm again with the **Menu/OK** key. **Result**: The display returns to the MAIN menu.

Note: Henceforth the key is displayed in the contextual menu line.

Removing Password

To cancel the password, follow the same procedure used to enter it.



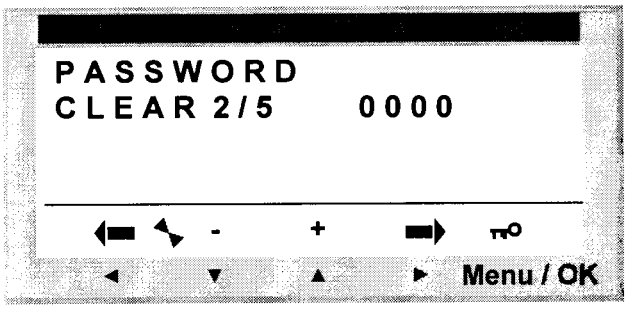
Initially, the key icon is displayed, meaning: Smart relay protected.

The message **CLEAR** and the number of attempts **1 / 5** appear in the window.

The following scenarios may arise:

- **Password correct**: The password is then inhibited, and the smart relay returns to the PASSWORD menu,
- **Password Incorrect**: The **CLEAR** counter is incremented.

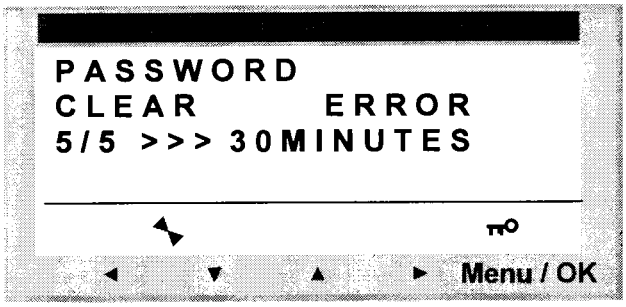
Illustration:



If an incorrect password is entered **5** times consecutively, the security function is locked for 30 minutes.

During this period, if the power supply to the smart relay fails, the downcount will start again on power up.

Illustration:



Modifying Password

To modify the password, simply cancel the old password and enter a new one.

FILTER Menu

Description

This function is used to detect more quickly any changes in states of Discrete inputs.

Two choices are available:

- Fast,
- Slow.

Response time:

Filtering	Commutation	Response time
Slow	ON → OFF	5 milliseconds
	OFF → ON	3 milliseconds
Fast	ON → OFF	0.5 milliseconds
	OFF → ON	0.3 milliseconds

This selection can only be made when the smart relay is in STOP. By default, the smart relays are configured in SLOW.

Note: This function is available on smart relays with a direct voltage power supply.

Note: to return to the main menu from the CONFIGURATION menu, use the navigation key ◄.

Filter-Type Selection

The current type is indicated by the selection symbol (black diamond).

Procedure for selection of filter type:

Step	Action
1	Select the type of filtering using the ▼ ▲ keys (the selection will flash).
2	Confirm with **Menu/OK**. **Result**: the display returns to the MAIN menu.

Zx KEYS Menu

Description

Note: Only accessible in **LD mode**.

The **Zx KEYS** option is used to activate or deactivate the use of the navigation keys as pushbuttons.

Different functions can be obtained depending on the state of this option:

- **Inactive**: The keys are only available for setting, configuring and programming the smart relay.
- **Active**: they can also be used in a control diagram.
  In this configuration, they operate as pushbuttons: Zx keys (see *Zx Keys, p. 91*), without the need to use a terminal input contact.

Note: To return to the main menu from the CONFIGURATION menu, use the navigation key ◄.

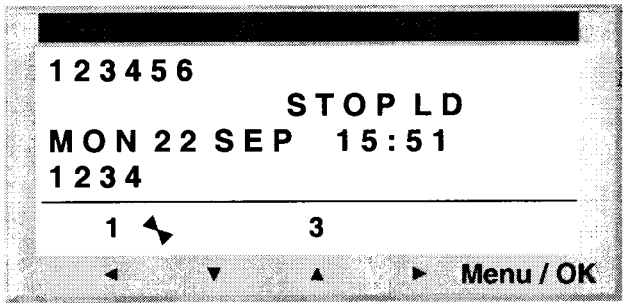
Zx Keys in RUN Mode

By default, the Zx keys are used as navigation keys.

In RUN mode, when the inputs-outputs screen, TEXT screen or DISPLAY screen is active, the numbers of the Zx keys used in the program are displayed in the contextual menu line.

To activate the key, simply select the required key ◄ ▼ ▲ ►.

Illustration:



Note: The function is inactive in Parameters mode, Monitoring and all the function block parameter and configuration screens.

WATCHDOG CYCLE Menu

Description

The duration of a program cycle depends on its length and complexity: In particular, the type and number of inputs-outputs and the number of extensions.

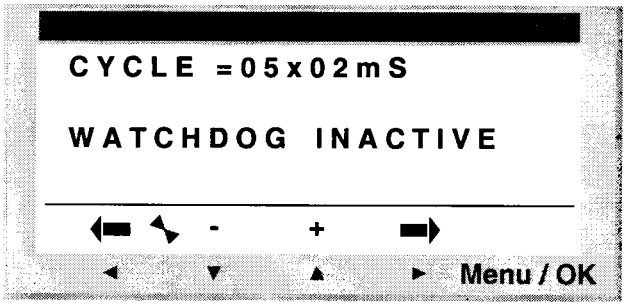
The program is executed periodically at regular time intervals. This time interval is called the **cycle** time.

The program will only execute completely if the cycle time is greater than the program execution time.

The cycle period is configurable in the **: CONFIGURATION → CYCLE WATCHDOG** menu. This period may be set from 6 to 90 milliseconds in 2-millisecond steps.

The default value of the cycle period is 10 milliseconds.

Illustration:



Note: Make sure that:
- Input variations that are too rapid are not masked by cycle time that is too slow,
- The speed of output variations is compatibles with system commands.

If the duration of the execution cycle of the program and the embedded software functions exceeds the cycle time value selected by the programmer, the WATCHDOG can be used to operate a specific action.

Note: In certain dialog phases, the cycle times are increased by the communication times between the PC and the smart relay. No guarantee can be made concerning the real cycle times during this operating mode. The WATCHDOG is always inhibited in this smart relay operating mode.

Note: To return to the main menu from the CONFIGURATION menu, use the navigation key ◄.

Actions

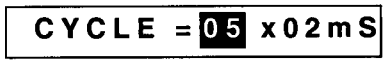
The WATCHDOG can perform the following different actions:

- **INACTIVE**: normal operating mode,
- **ALARM**: A warning state is set and the warning number corresponding to **Cycle time overrun** is accessible in the **FAULT** menu,
- **ERROR**: the program stops (STOP mode) and the error number corresponding to: **Cycle time overrun** is accessible in the **FAULT** menu.

Cycle Time

The cycle time may be set from 6 to 90 milliseconds in 2-millisecond steps.

To adjust this period, adjust the step multiplier factor by 2 milliseconds using the + and - keys of the contextual menu. This factor is between 3 and 45.



The multiplier factor is adjusted depending on the shortest sampling period of the inputs.

WATCHDOG Configuration

Procedure:

Step	Action
1	Configure the **CYCLE** parameter using the + and - keys of the contextual menu.
2	Confirm the entry using one of the keys: ◄ or ►. **Result**: The **CYCLE** parameter is confirmed and the **WATCHDOG** parameter is selected (it flashes).
3	Configure the **WATCHDOG** parameter using the + and - keys of the contextual menu.
4	Confirm your changes by pressing the **Menu/OK** key. **Result**: The display returns to the MAIN menu.

CLEAR PROGRAM Menu

9

CLEAR PROG Menu.

Description

Note: Accessible only in **LD mode**.

This function is used to clear the entire program.

Note: If the program is protected (key displayed), the user must enter the password (see *PASSWORD Menu, p. 58*) before being able to delete the program.

Clearing the Program

On opening, NO is selected by default.

Procedure:

Step	Action
1	Select the **YES** choice using the navigation keys ▼ and ▲.
2	Confirm the clear command by pressing the **Menu/OK** key. **Result**: the display returns to the MAIN menu.

TRANSFER Menu

10

TRANSFER Menu

Description

This function is used to:

- Load the firmware and the application contained in the smart relay into the backup memory.
- load firmware and application from the backup memory to the smart relay.

This backup memory can then be used to load the firmware and the application into another smart relay.

Illustration:

Note: The backup memory is provided as an option.

Note: Insertion and extraction of the backup memory may be performed even when the smart relay is powered up.
For smart relays without screens, detection of the memory may only be performed on power up of the smart relay, if the memory is inserted when the smart relay is powered on, it will not be acknowledged.

Note: If the application is protected (key icon displayed), the user must enter the password before being able to save the program.

Note: if an application is already present in the backup memory, it will be overwritten by the new transfer (no test is performed to check the memory is free).

Note: It is not possible to directly transfer an application created with version V2 of the programming software from the SR2 MEM01 memory to the smart relay if this latter contains version V3 firmware.
In this case, see what action you should take in the section Program incompatible with firmware of the module (see *Application incompatible with firmware on the smart relay, p. 70*).
For more information about the compatibility of the memory cartridges, see *Compatibility between the memory cartridges and the version of the firmware on the smart relay, p. 195.*

Module → Backup Memory Transfer

Procedure for transferring the application, from the smart relay to the backup memory:

Step	Action
1	Insert the EEPROM cartridge (SR2 MEM02) into the slot provided.
2	Select the transfer type: **MEMORY>ZELIO** using the navigation keys ▼ ▲.
3	Confirm the transfer command with the **Menu/OK** key. (Enter the password if the program is password-protected).
4	Wait for the transfer to end. Display: > > > **MEMORY** then **TRANSFER. OK** when it is complete.
5	Confirm again by pressing **Menu/OK** key to exit the menu. **Result**: The display returns to the INPUTS-OUTPUTS screen in RUN mode and to the MAIN menu in STOP mode.

Backup Memory → Module Transfer

Procedure for transferring the application, from the backup memory to the smart relay, for a **smart relay with LCD and keyboard**:

Step	Action
1	Insert the EEPROM cartridge (SR2 MEM02) with the program to be transferred into the slot provided.
2	Select the transfer type: **MEMORY>ZELIO** using the navigation keys ▼ ▲.
3	Confirm the transfer command with the **Menu/OK** key.
4	Wait for the transfer to end. Display: > > > **MODULE** then **TRANSFER. OK** when it is complete.
5	Confirm again by pressing **Menu/OK** to exit the menu. **Result**: the display returns to the INPUTS-OUTPUTS screen in RUN mode and to the MAIN menu in STOP mode.

Procedure for transferring the application, from the backup memory to the smart relay, for a **smart relay without LCD or keyboard**:

Step	Action
1	Since the smart relay **is not powered-on**, insert the EEPROM cartridge (SR2 MEM02) into the slot provided.
2	Power up the smart relay. During the transfer, the LED display is off.
3	Wait for the transfer to end. During the transfer, the LED display is off, then at the end of the transfer the LED flashes.
4	• If the flashing is slow (3 Hz), the transfer has been successful, the smart relay is in RUN, remove the EEPROM cartridge (SR2 MEM02). • If the flashing is rapid (5Hz), the transfer has failed due to incompatibility between the configuration necessary for the program to be transferred and that of the smart relay.

Note: When the smart relay is in STOP mode, the LED display is lit and does not flash.

Possible Errors

Below are the possible errors and, for each case, the messages that are displayed:

- **Absence of backup memory**
  Error message:
  TRANSFER ERROR: NO MEMORY
- **Configurations of the hardware and program to transfer incompatible**
  Error message:
  TRANSFER ERROR: CONFIG INCOMPAT (hardware or software reference numbers).

Refer to the *DEFAULT Menu, p. 77* chapter to consult the error number and clear it.

Note: The transfer of one module program to another via a memory card is only possible between smart relays with the same reference. For example, it is impossible to transfer a program from a module with a clock to a module that does not have one.

Application incompatible with firmware on the smart relay

If the application stored in backup memory SR2 MEM01 was created with a version of the programming software that is incompatible (see *Compatibility between the memory cartridges and the version of the firmware on the smart relay, p. 195*) with the firmware of the target smart relay, proceed as follows:

Step	Action
1	Load the application from the backup memory to a smart relay with compatible firmware. **Note:** If no smart relay has firmware that is compatible with the application, use the programming software version that was used to create the application to load compatible firmware into the target smart relay:
2	Use the version of the programming software that was used to create the application to load it from the smart relay toward the PC.
3	Save the application uploaded in step 2.
4	Launch the latest version of the programming software.
5	Open the application saved in step 3. **Result**: The programming software converts the application.
6	Load the converted application and the associated firmware to the target smart relay.

Use of SR2 MEM01 and SR2 MEM02

On SR2 MEM01, only the program is loaded whereas on SR2 MEM02 the program and the corresponding firmware is loaded.

Consequently:

- With the SR2 MEM01 memory cartridge, you can perform:
  - A smart relay to memory transfer if the version of the firmware on this relay is strictly lower than 3.09.
  - A memory to smart relay transfer if the program contained in the SR2 MEM01 memory cartridge is loaded from a smart relay that has the same version of firmware as the smart relay to which you want to load the cartridge.
- With the SR2 MEM02, memory cartridge, you can perform:
  - A smart relay to memory transfer if the version of the firmware on this relay is equal to or higher than 3.09.
  - A memory to smart relay transfer if the version of the firmware on the relay to which you want to load the cartridge is higher than 3.09.

For more information about the compatibility of the memory cartridges, see *Compatibility between the memory cartridges and the version of the firmware on the smart relay, p. 195.*

VERSION Menu

11

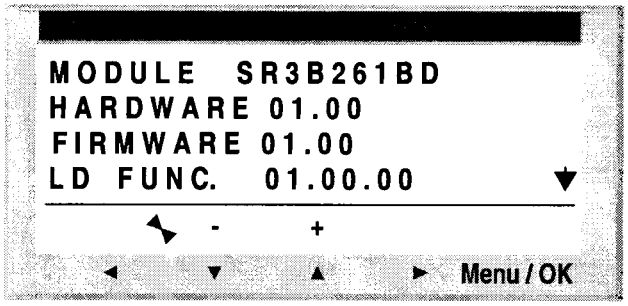
VERSION Menu

Description

This function is used to precisely identify the version of each system component:

- Type of hardware,
- Firmware,
- LD functions,
- FBD functions.

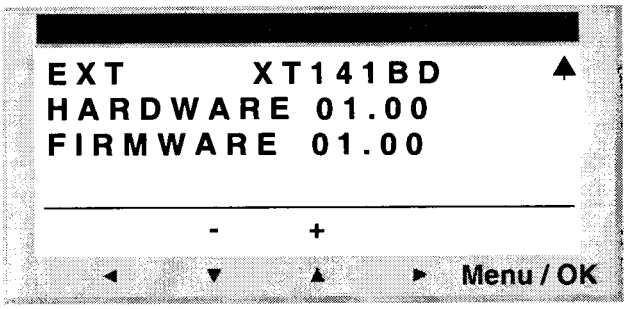
Illustration:



This information is available for the smart relay, but also for the connected extensions.

The ▼ symbol is present in the bottom right, indicating the existence of extensions connected to the smart module.

Illustration:



To quit, press the **Menu/OK** button, the display returns to the INPUTS-OUTPUTS screen in RUN mode and to the MAIN menu in STOP mode.

LANGUAGE Menu

12

LANGUAGE Menu

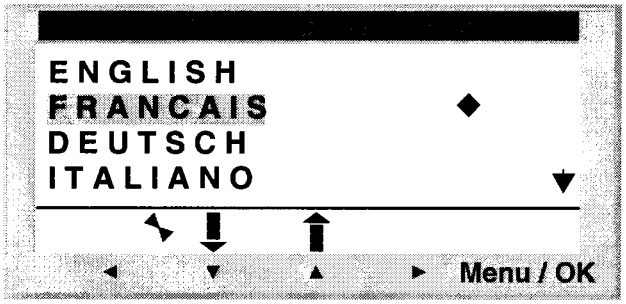
Description

This function is used to select the language used by the smart relay.

All messages may be viewed in 6 languages:

- English,
- French,
- German,
- Italian,
- Spanish,
- Portuguese.

Illustration:



Language Selection

The current language is indicated by the selection symbol (black diamond).

Language selection procedure:

Step	Action
1	Select the language using the navigation keys: ▼ and ▲ (the selection flashes).
2	Confirm with the **Menu/OK** key. **Result**: The display returns to the INPUTS-OUTPUTS screen in RUN mode and to the MAIN menu in STOP mode.

DEFAULT Menu

13

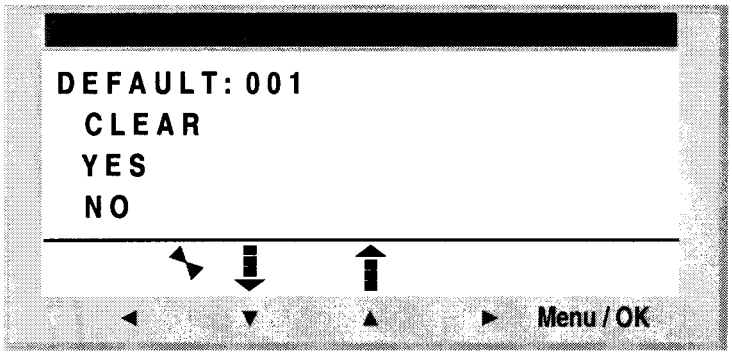
FAULT Menu

Description

This function is used to:

- Display on the LCD screen the type of fault detected by the firmware of the smart relay (error or warning: Watchdog overrun, *see WATCHDOG CYCLE Menu, p. 63*, cycle time too high, etc.),
- Reset the fault counter to zero.

Illustration:



Reset to Zero of the Fault Counter

To reset the fault counter to zero, proceed as follows:

Step	Action
1	Select the **YES** choice using the navigation keys ▼ and ▲.
2	Confirm the clear command by pressing the **Menu/OK** key. **Result**: The display returns to the INPUTS-OUTPUTS screen in RUN mode and to the MAIN menu in STOP mode.

Fault Types Below, the description of possible faults:

Number	Type of fault
000	**No faults**
001	**Fault in writing to EEPROM** This fault defines the transfer problems between the memory cartridge and the smart relay. If this fault occurs frequently, contact the after-sales service.
002	**Clock write fault** If the fault occurs frequently, contact the after-sales service.
004	**Overload on solid state relay outputs** Once a transistor output reaches a temperature of 170°C, the group of 4 outputs to which it belongs is deactivated. To make this group of outputs operational, the cause of the over current (short-circuit, etc.) must first be deleted, and then the fault cleared from the FAULT menu (see *FAULT Menu, p. 77*).
050	**Smart relay firmware is damaged** Reload the firmware on the smart relay and the user application. If this problem persists, contact the after-sales service.
051	**Watchdog overflow** Warning or error according to the selection made in the menu (smart relay display) or in the configuration window (programming software). The cycle time in the smart relay is too short compared with the application program execution time programmed in the smart relay. If the application requires cycle time or strict sampling of the smart relay inputs/outputs, lengthen the application cycle time in the smart relay. To do this, either set the parameters in the CONFIGURATION menu (smart relay display) or in the configuration window (programming software). If the application does not require the cycle time, you must choose: **No WATCHDOG Action**, in the CONFIGURATION menu.
052	**The smart relay has executed an unknown operation** If the fault is permanent , reload the firmware on the smart relay and the user application. If this problem persists, contact the after-sales service.
053	**Link fault between smart relay and bus-type extension** Check operation of the extension (connection, power supply, fault).
054	**Link fault between smart relay and input/output-type extension** Check operation of the extension (connection, power supply and fault).
058	**A fault has been detected in the firmware (software specific to the smart relay) or on the smart relay hardware.** If the fault is permanent, reload the firmware on the smart relay and the user program. If this problem persists, contact the after-sales service.
059	**At the beginning of RUN on the smart relay application: The application cannot switch to RUN because it is incompatible with the smart relay physically connected to the power supply.** If this problem occurs, contact the after-sales service.
060	**At the beginning of RUN on the smart relay application: Program incompatible with the bus extension physically connected to the power supply.** If this problem occurs, contact the after-sales service.

Number	Type of fault
061	**At the beginning of RUN on the smart relay application: Program incompatible with the Input/ Output extension physically connected to the power supply.** If this problem occurs, contact the after-sales service.
062	**Version (or build number) incompatibility when loading a program from the backup memory** If this problem occurs, contact the after-sales service.
063	**Hardware configuration incompatibility when loading a program from the backup memory** If this problem occurs, contact the after-sales service.

CHANGE DATE/TIME Menu

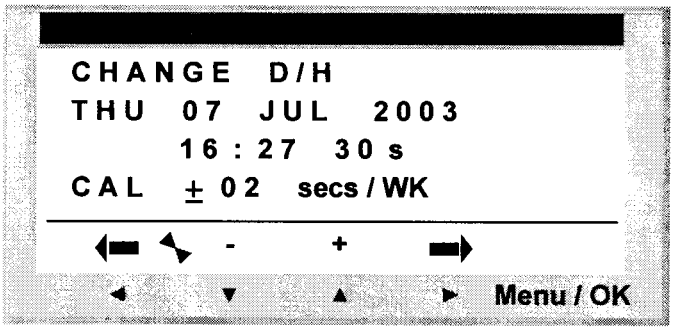
14

CHANGE DATE/TIME Menu

Description

This function is used to configure the date and time of the smart relays that have a clock.

Illustration:



The modifiable parameters are:

- Day / week / month / year,
- Hour, minutes, seconds,
  Values are recorded by pressing the **Menu/Ok** key; if you wish to specify the time more accurately, you should complete the entry of modifications with minutes and seconds.
- CAL: Calibration of the internal clock of the smart relay in seconds per week.

Clock Calibration

The quartz that controls the real-time clock of the smart relay has a variable monthly drift depending on the environmental conditions of the smart relay.

The maximum value for this drift is approximately one minute per month.

To estimate this drift, proceed by observing the drift on the smart relay clock with respect to a standard reference clock for a few weeks or more.

Example:

If you wish to compensate this drift, you can for example make a -15 second correction per week to compensate for a + 60 second drift per month. This compensation is executed on Sunday at one O'clock in the morning.

Note: This correction serves no purpose if the smart relay is subject to long power interruptions or major variations in temperature.

Clock Configuration

Procedure:

Steps	Description
1	Select the parameter to modify using the navigation keys ◄ and ►. **Result**: The selected parameter flashes. (When you enter this mode, the day value is selected)
2	Modify the value of the parameter. The + and - keys of the contextual menu can be used to change the current value.
3	Confirm the changes by pressing the **Menu/OK** key. **Result**: The display returns to the MAIN menu.

Note: The smart relay contains a software module that determines the day of the week when the user selects the day of the month in the year.

Note: You are not allowed to modify the hour by a product between 2:00 and 3:00 AM for the days of the change from summer to winter time (at 3:00 it is 2:00)

CHANGE SUMMER/WINTER Menu

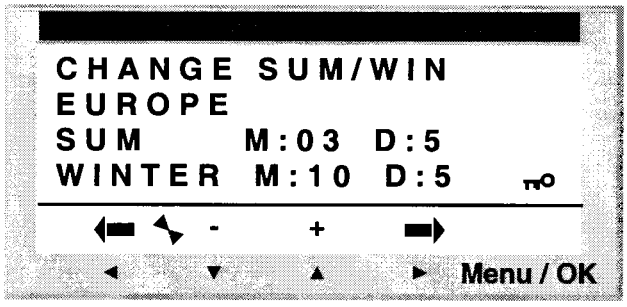
15

CHANGE SUMMER/WINTER Menu

Description

This function is used to change the time range automatically: Summer/winter, for smart relays with a clock.

Illustration:



The following operating modes are possible:

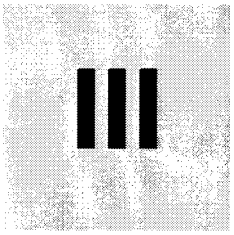
- **NO**: no change,
- **Automatic**: The change takes place automatically, the dates are preset according to the geographic zone:
  - EUROPE: Europe,
  - USA.
- **OTHER ZONE**: (MANUAL) the change takes place automatically, but you must specify, for summer and winter:
  - The month: **M**,
  - The Sunday: **D** (1, 2, 3, 4 or 5) when the change takes place.

Configuration of the Time Change

To configure automatic time change, proceed as follows:

Step	Action
1	Select the parameter to modify using the navigation keys ◄ and ►. **Result**: The selected parameter flashes.
2	Modify the parameter value. The **+** and **-** keys of the contextual menu are used to change the current value.
3	Confirm the changes by pressing the **Menu/OK** key. **Result**: The display returns to the MAIN menu.

LD Language



At a Glance

Subject of this Section

This section describes the use of LD (Ladder Diagram) programming language for the smart relay.

What's in this Part?

This part contains the following chapters:

Chapter	Chapter Name	Page
16	LD Language Elements	87

LD Language Elements

16

At a Glance

Subject of this Chapter

This chapter describes the different automation functions of the LD language.

What's in this Chapter?

This chapter contains the following topics:

Topic	Page
Introduction	88
Discrete Inputs	89
Zx Keys	91
Auxiliary Relays	93
Discrete (DISCR) Outputs	98
Timers	101
Counters	111
Fast Counter	118
Counter Comparators	128
Analog Comparators	129
Clocks	134
Texts	138
LCD Screen Backlighting	140
Change to Summer / Winter Time	141
Modbus Inputs/Outputs	143
Message	144

Introduction

Description

In **LD** programming mode, an application can be created from the interface of the front panel of the smart relay.

Here is detailed information on all possible elements of a ladder diagram in **LD** mode that are recognized and used by smart relays.

To better understand the functions performed by each element, where necessary a directly usable example is included.

Composition of Ladder Diagrams

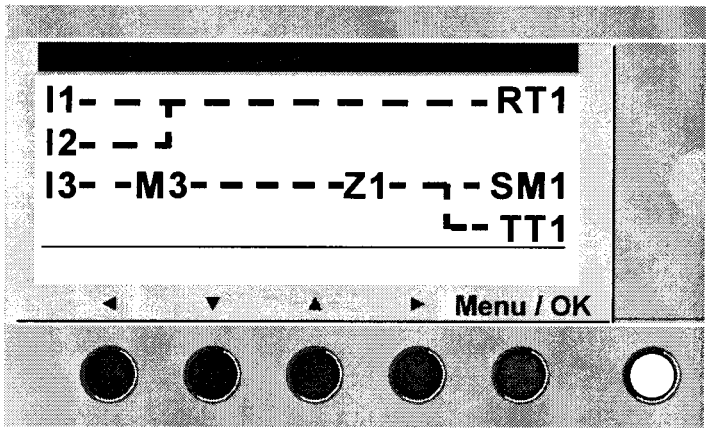
Smart relays accept 120-line diagrams.

- Each line is comprised of a maximum of 5 contacts.
- Contacts must be attached to one coil, and the coil is not necessarily on the same line.

Note: When an application requires more than five contacts to activate an action, the auxiliary relays may be used.

Sample Ladder Diagram

Below is an example of a ladder diagram, as it appears on the display of the front panel of a smart relay:



Discrete Inputs

Description

The **Discrete Inputs** can be used exclusively as contacts in the program.

These contacts represent the status of the input for the smart relay connected to a sensor (push button, switch, sensor, etc.).

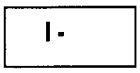
The contact number corresponds to the number of terminals of the associated input: 1 to 9, then A to R (except for letters I, M and O) according to the smart relay and the possible extension.

Use as a Contact

This contact may use the direct state of the input (normally open mode) or its inverse state (mode normally closed), see below.

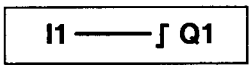
Normally open mode:

Symbol of a normally open contact:



A normally open contact corresponds to the use of the **direct** state of the input. If the input is **supplied**, the contact is said to be **conducting**.

Example: Using a pushbutton to switch a lamp on and off.



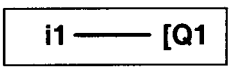
If input **1** is supplied, contact **I1** is closed, and coil **Q1** is activated.

Normally closed mode:

Symbol of a normally closed contact:

A normally closed contact corresponds to the use of the **reverse** state (logical complement of the direct state) of the input. If the input is **supplied**, the contact is said to be **non-conducting**.

Example: Controlling a lamp using an input in reverse state.



If input **1** is supplied, contact **i1** is open, and coil **Q1** is non-activated.

Modification of the state of a contact

To modify a contact from the front panel of the smart relay (the programming window is displayed on the screen), simply:

- Place the cursor over the letter of the contact,
- Proceed as indicated in the paragraph *Modifying an element,, p. 44*, to scroll through the possible contact types (**I** for a normally open contact, **i** for a normally closed contact).

Initialization

Status of contacts on program initialization:

- The direct state is inactive,
- The reverse state is active.

Zx Keys

Description

The navigation keys behave exactly like the **I** physical inputs (Discrete inputs). The only difference is that they do not correspond to smart relay connection terminals, but to the four gray buttons on the front panel.

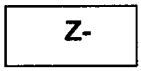
They are used as pushbuttons, and can only be used as contacts.

Use as a Contact

This contact may use the direct state of the key (normally open mode) or its inverse state (mode normally closed), see below.

Normally open mode:

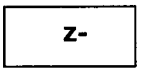
Symbol of the normally open contact, representing a key:



The **normally open** mode corresponds to the use of the direct state of the key. If the key is **pressed**, the corresponding input is said to be **conducting**.

Normally closed mode:

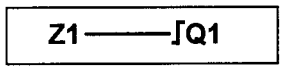
Symbol of the normally closed contact, representing a key:



The **normally closed** mode corresponds to the use of the reverse state (logical complement of the direct state) of the key. If the key is **pressed**, the corresponding input is said to be **non-conducting**.

Example

Creating a switch operated by the **Z1** key and **Q1** output:



Each time the Z1 key is pressed, the Q1 output changes state.

Deactivation of Zx Keys

By default the **Zx Keys** are active. They may be deactivated in one of the following ways:

- From the smart relay front panel: Using **: CONFIGURATION → Zx KEYS** menu, see *Zx KEYS Menu, p. 62*
- From the programming software: See on-line help of the programming software for more information.

Note: When the smart relay is in RUN mode, if the **Zx Keys** have been deactivated, they cannot be used for inputs in the program, but can be only used for navigating the menus.

Modification of the State of a Contact

To modify a contact from the front panel of the smart relay (the programming window is displayed on the screen), simply:

- Place the mouse over the letter representing the contact,
- Proceed as indicated in the paragraph *Modifying an element,, p. 44*, to scroll through the possible contact types (**Z** for a normally open contact, **z** for a normally closed contact).

Initialization

Status of contacts on program initialization:

- Normally open mode (direct state) is inactive,
- Normally closed mode (reverse state) is active.

Auxiliary Relays

Description

Auxiliary relays marked **M** behave in exactly the same way as **Q Discrete outputs** (see *Discrete (DISCR) Outputs, p. 98*), but do not have an electrical output contact. They can be used as internal variables.

There are 31, numbered from 1 to 9 and from A to Y except for letters I, M, O.

All auxiliary relays can be used, in the program, indifferently either as a coil or contact. They can be used to latch a state to be used in the form of the associated contact.

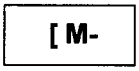
Use as a Coil

To use an auxiliary relay as a coil, 4 modes are available:

- Contactor mode,
- Impulse relay mode,
- Latch mode,
- Unlatch mode.

Contactor mode:

Symbol of an auxiliary relay, used as a coil in contactor mode:



The relay is energized if the contacts to which it is connected are conducting. Otherwise it is not energized.

Impulse relay mode:

Symbol of an auxiliary relay, used as a coil in impulse relay mode:

Pulse energization, the coil changes state on each pulse it receives.

Latch mode:

Symbol of an auxiliary relay, used as a coil in latch mode:

The **SET** relay, also called the latch relay, is energized as soon as the contacts to which it is connected are conducting, then stays set even if later the contacts are no longer conducting.

This behavior is identical to that of an RS logic flip-flop.

Unlatch mode:

Symbol of an auxiliary relay, used as a coil in latch mode:

The **RESET** relay, also called the unlatch relay, is deactivated when the contacts to which it is connected are conducting. It remains deactivated even if later the contacts are no longer conducting.

Note: for reasons of increasing compatibility for programs operating with Zelio 1, the four types of mode for any given Q output coil or M auxiliary relay can be used in the same wiring diagram in Zelio 2.

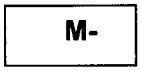
Use as a Contact

Auxiliary relays can be used as contacts as many times as necessary.

This contact may use the direct state of the relay (normally open mode) or its inverse state (mode normally closed), see below.

Normally open mode:

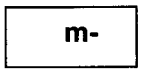
Symbol of an auxiliary relay, used as a contact in normally open mode:



A relay used as **normally open contact** corresponds to the use of the direct state of the relay. If it is **powered**, the contact is said to be **conducting**.

Normally closed mode:

Symbol of an auxiliary relay, used as a contact in normally closed mode:



An auxiliary relay used as a **normally closed contact**, corresponds to the use of the reverse state (logical complement of the direct state) of the relay. If it is **powered**, the contact is said to be **non-conducting**.

Example

In the following example turning on and off a lamp is conditioned by the [illegible] 6 following inputs: I1, I2, I3, I4, I5 and IB.

The is on when:

- The I1, I4, I5 and IB inputs are set to the state 1,

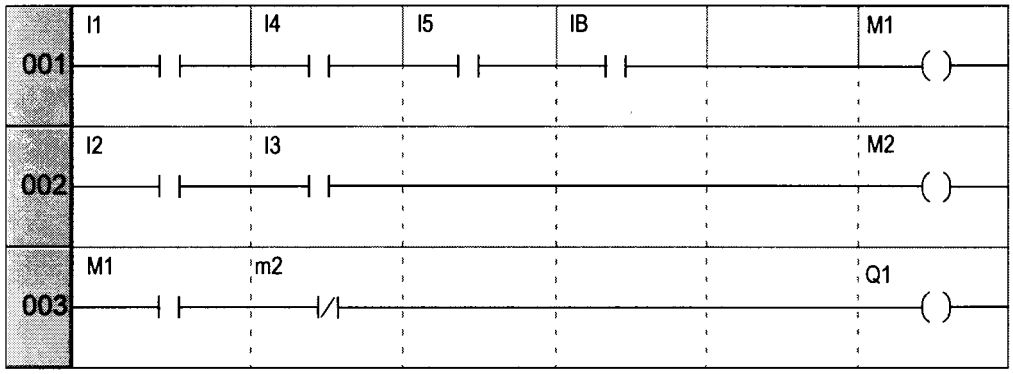
and

- The I2, I3 are set to state 0.

Because the smart relay does not allow more than five contacts on a line, auxiliary relays are used to control the lamp.

You choose to memorize the state of inputs I1, I4, I5 and IB using the auxiliary relay M1 and memorize the state of inputs I2 and I3 using the auxiliary relay M2. The lamp is controlled by relays M1 and M2, used respectively as normally open contact and as normally closed contact.

Illustration:



Modifying the Mode of a Coil or a Contact

To modify the operating mode of a coil or a contact from the front panel of the smart relay (the programming window displayed on screen), simply:

- Position the cursor on the symbol representing the coil mode or on the letter of the contact,
- Proceed as indicated in the paragraph *Modifying an element,, p. 44*, to scroll through the possible modes for a coil or contact types possible (**M** for normally open contact, **m** for a normally closed contact).

Initialization

Status of contacts on program initialization:

- Normally open mode (direct state) is inactive,
- Normally closed mode (reverse state) is active.

Latching

By default, after a power failure, the relay is in the state that corresponds to program initialization.

To restore the state of the output backed up during power loss, the latching must be activated:

- From the front panel: From the **PARAMETERS** (see *PARAMETERS Menu, p. 51*) window,

or

- In the programming software: Enable the **Latching** option in the parameters window associated with the relay.

Discrete (DISCR) Outputs

Description

Discrete Outputs correspond to the smart relay output relay coils (connected to the actuators). These outputs are numbered from 1 to 9, then from A to G, according to the smart relay and any extensions.

Any Discrete output can be used, in the program, indifferently either as a coil or a contact.

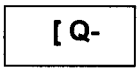
Use as a Coil

To use a Discrete output as a coil, four modes are available:

- Contactor mode,
- Impulse relay mode,
- Latch mode,
- Unlatch mode.

Contactor mode:

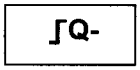
Symbol of a Discrete output, used as a coil in contactor mode:



The coil is energized if the contacts to which it is connected are conducting. Otherwise it is not energized.

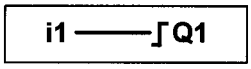
Impulse relay mode:

Symbol of a Discrete output, used as a coil in impulse relay mode:



Pulse energization, the coil changes state on each pulse it receives.

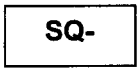
Example: Switching a lamp on and off with a pushbutton:



A push button is connected to input **I1** and a lamp to output **Q1**. Every time the button is pressed, the lamp switches on or off.

Latch mode:

Symbol of a Discrete output, used as a coil in latch mode:



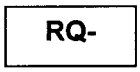
The **Set** coil, also called the latch coil, is energized as soon as the contacts to which it is connected are conducting, then stays set even if later the contacts are no longer conducting.

This behavior is identical to that of an RS logic flip-flop.

Example: Switching a lamp on and off with two pushbuttons: See Latching Mode below.

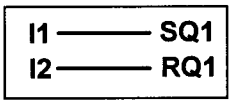
Unlatch mode:

Symbol of a Discrete output, used as a coil in unlatch mode:



The **RESET** coil, also called the unlatch coil, is deactivated when the contacts to which it is connected are conducting. It remains inactive even if later the contacts are no longer conducting.

Example: Switching a lamp on and off with two pushbuttons: See Unlatch Mode



BPI1 is connected to input I1. BPI2 to input I2. The lamp is controlled by output Q1. The lamp turns on when pushbutton BPI1 is pressed, and it turns off when pushbutton BPI2 is pressed.

Note: Output use rule:
- An output may only be used at one single point in the program as a coil.
- If a SET coil is used for a Discrete output, it is advisable to provide a RESET coil for this output. The RESET coil takes priority over the SET coil.
  The use of a Set coil on its own is only justified for activating an alarm signal that can be reset only by an INIT + ON action from the program.

Note: For reasons of upward compatibility for programs operating with Zelio 1 smart relays, the four types of modes for any given Q output coil or M auxiliary relay can be used in the same wiring diagram in Zelio 2.
In this case, the operating mode is determined by the coil activated first.

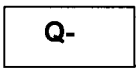
Use as a Contact

An output can be used as an auxiliary contact as many times as necessary.

This contact may use the direct state of the output (normally open mode) or its inverse state (normally closed mode), see below.

Normally open mode:

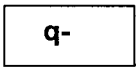
Symbol of a Discrete output, used as a contact in normally open mode:



An output used as a **normally open** auxiliary contact corresponds to the use of the direct state of the output. If it is **powered**, the contact is said to be **conducting**.

Normally closed mode:

Symbol of a Discrete output, used as a contact in normally closed mode:



An output used as a **normally closed** auxiliary contact corresponds to the use of the reverse state (logical complement of the direct state) of the output. If it is **powered**, the contact is said to be **non-conducting**.

Modifying the Mode of a Coil or a Contact

To modify the operating mode of a coil or a contact from the front panel of the smart relay (the programming window displayed on screen), simply:

- Position the mouse on the symbol representing the coil output mode or on the letter of the contact representing the output,
- Proceed as indicated in the paragraph *Modifying an element,, p. 44*, to scroll through the possible modes for coils or contact types possible (**Q** for normally open contact, **q** for a normally closed contact).

Initialization

Status of contacts on program initialization:

- Normally open mode (direct state) is inactive,
- Normally closed mode (reverse state) is active.

Latching

By default, after a power failure, the relay is in the state that corresponds to program initialization.

Activate latching to restore the state of the output backed up during power loss:

- From the front panel: from the **PARAMETERS** (see *PARAMETERS Menu, p. 51*) window,

or

- In the programming software: Enable the **Latching** option in the parameters window associated with the output.

Timers

Description

Use the **Timers** function to delay, prolong and control actions over a predetermined period. Durations can be set using one or two preset values, according to the type of timer.

There are 11 types of timers:

- On delay (A),
- On delay, stop by reset (A),
- Off delay (C),
- On pulse one shot: Pulse calibrated on the command input (B) falling edge.
- Timing after pulse: calibrated on falling edge of the command input (W),
- Flasher unit, control held down synchronously (D),
- Flasher unit, Press to start/stop, Synchronous (D),
- Time on addition (T),
- A/C,
- Flasher unit, control held down asynchronously (L),
- Flasher unit, Press to start/stop, Asynchronous (I),

Refer to the Timing Diagrams paragraph for the description of different types of timers.

The smart relay has 16 timer function blocks, numbered from 1 to 9 then from A to G.

Each block has a reset input, a command input and an output used to indicate timer time-out.

Use of Coils

Two coils are associated with each timer:

- Coil **TT**: **Command Input**,
- Coil **RC**: **Reset Input**,

The use of these coils is described below.

Command input:

Symbol of the Command input coil of a timer:

TT-

Each type involves a specific operation, which can be used to manage all possible scenarios in an application.

Reset input:

Symbol of the Command input coil of a timer:

RT-

Energization of the coil causes a reset of the current timer value: contact T is deactivated and the function is ready for a new timer cycle.

Note: this coil is only necessary for pulse start/stop type timers.

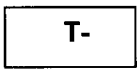
Use as a Contact

The contact associated with the timer indicates whether the timer has stopped.

It may be used as many times as necessary in the program. It may be used according to 2 modes: normally open or normally closed, described below.

Normally open mode:

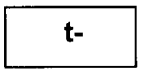
Symbol of the normally open contact associated with a timer:



A normally open contact corresponds to the use of the direct state of the output of the Timer function block If this output is **active**, the contact is said to be **conducting**.

Normally closed mode:

Symbol of the normally closed contact associated with a timer:



A normally closed contact corresponds to the use of the reverse state (logical complement of the direct state) of the output of the Timer function block. If this output is **active**, the contact is said to be **non-conducting**.

Configuration from Front Panel

The block's parameter settings can be accessed either when entering the command line or from the **PARAMETERS** menu if the block has not been padlocked.

The parameters to enter are the following:

- Timer type,
- Preset value(s),
- Time unit,
- Parameter lock,
- Latching.

Type of timer:

This parameter allows you to choose the type of timer function from among the 11 types available. Each type is represented by a letter:

- A: Active, control held down,
- a: Active, Press to start/stop,
- C: Off delay
- A/C: Combination of A and C,
- B: On pulse one shot: Pulse calibrated on the command input rising edge,
- W: Timing after pulse: Pulse calibrated on the command input falling edge,
- D: Flasher unit, control held down synchronously,
- d: Flasher unit, Press to start/stop, Synchronous,
- L: Flasher unit, control held down asynchronously,
- l: Flasher unit; Press to start/stop, Asynchronous
- T: Time on addition.

Preset value:

Depending on the type of timer, there can be 1 or 2 preset values:

- 1 only preset value (types: A, a, C, B, W, D, d and T):

  [t] : on-delay or off-delay according to type.

- 2 only preset value (types: A/C, L and I):

  [A] : Timer on-delay in the case of A/C type; active state in the case of flasher units L and I.

  [B] : Timer off-delay in the case of A/C type; inactive state in the case of flasher units L and I.

Time unit:

This is the time unit for the preset value. There are five possibilities:

Unit	Symbol	Form	Maximum value
1/100 of a second	s	00.00 s	00.00 s
1/10 of a second	S	000.0 s	00.00 s
Minutes : Seconds	M : S	00 : 00	99 : 99
Hour : Minute	H : M	00 : 00	99 : 99
Hours Only for type T.	H	0 000 h	9,999 h

Parameter lock:

Symbol of the **Parameter Lock** parameter:

[🔒] Verrouillé [🔓] Non verrouillé

Locking prevents the modification of locked parameters from the front panel of the smart relay via the PARAMETERS menu.

Latching:

By default, if a power break occurs while a timer function block is running, any information on time already elapsed is lost. When the supply voltage returns, the time function block is reinitialized and ready for a new operating cycle.

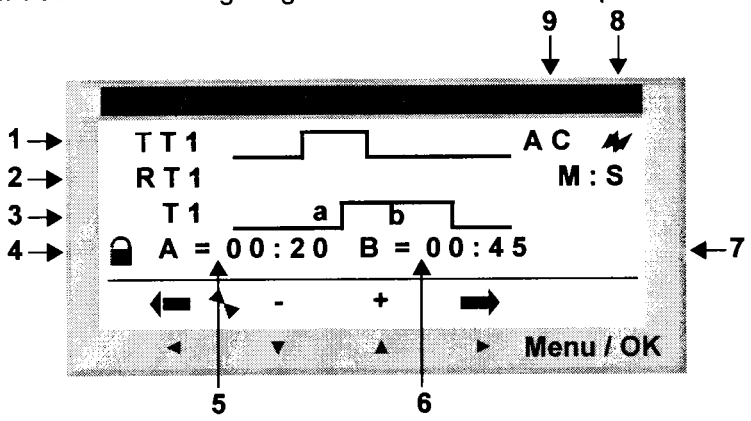
If the application requires it, the time elapsed before the power break can be memorized using the **Latching** parameter.

Symbol of the **Latching** parameter:

Activé Non activé

This function is used to save the state of the timer's current values and memorize the elapsed time in the event of a power break.

Illustration: Configuring a counter from the front panel of the smart relay:



Description:

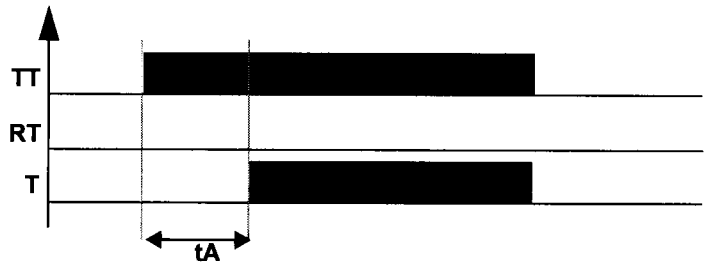
Number	Parameter	Description
1	**Command input**	Command input timing diagram.
2	**Reset input**	Reset input timing diagram.
3	**Timer output**	Timer output timing diagram.
4	**Parameter lock**	This parameter is used to lock the counter parameters. When the block is locked, the preset value no longer appears in the PARAMETERS menu.
5	**Timer on-delay**	Timer on-delay of the A/C timer.
6	**Timer off-delay**	Timer off-delay of the A/C timer.
7	**Time unit**	Time unit for the preset value.
8	**Latching**	Backup of state of the current counter value in the event of a power cut.
9	**Timer type**	Type of timer used.

Timing Diagrams

Timing diagrams are provided here to illustrate the various behaviors of the Timer function block, according to the type of timer chosen:

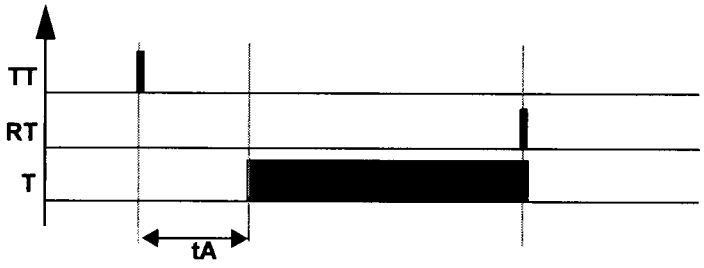
Active, control held down (type A):

The following diagram shows the operation of the type A timer:



Active, Press to start/stop (type a):

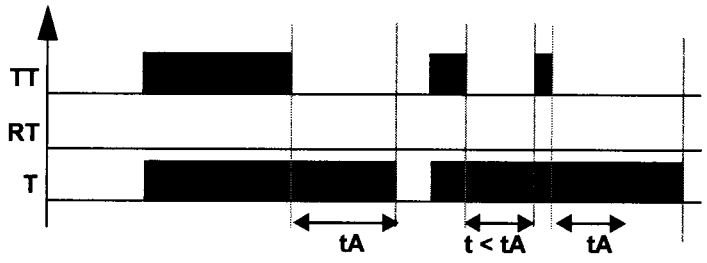
The following diagram shows the operation of the type a timer:



Note: each pulse on the TTx input resets the current timer value to 0.

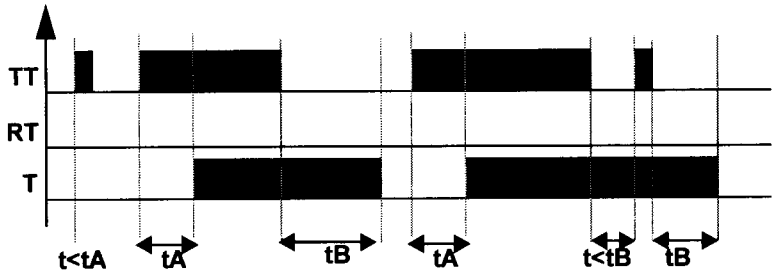
Off delay (type C):

The following diagram shows the operation of the type C timer:



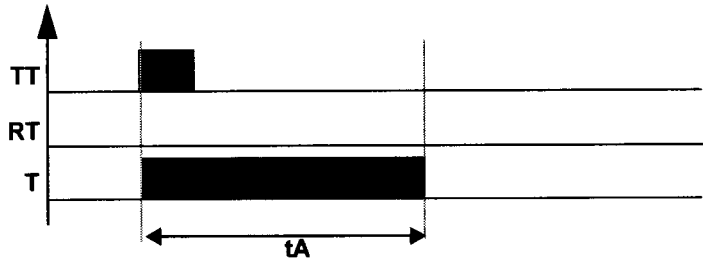
A/C: Combination of A and C,

The following diagram shows the operation of the type A/C timer:



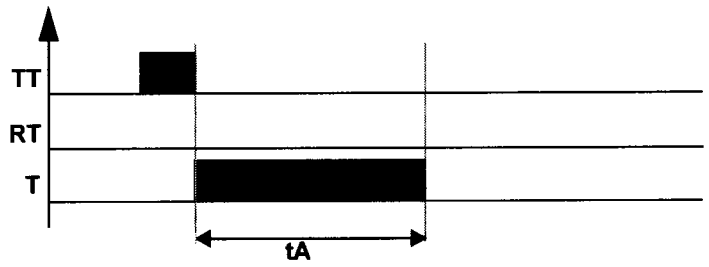
On pulse one shot (type B):

The following diagram shows the operation of the type B timer:



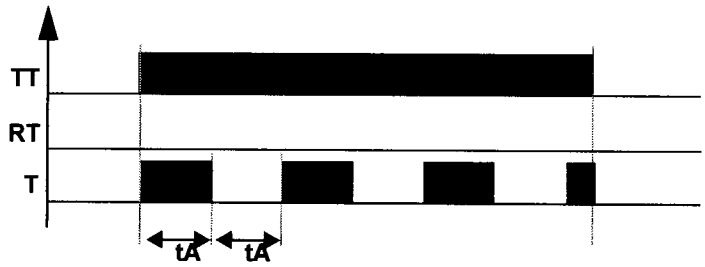
Timing after pulse (type W):

The following diagram shows the operation of the type W timer:



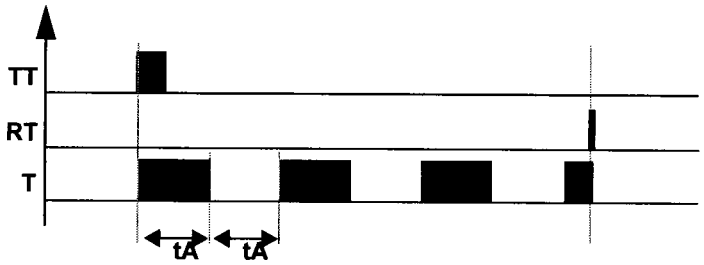
Flasher unit, control held down synchronously (type D):

The following diagram shows the operation of the type D timer:



Flasher unit, Press to start/stop, Synchronous (type d):

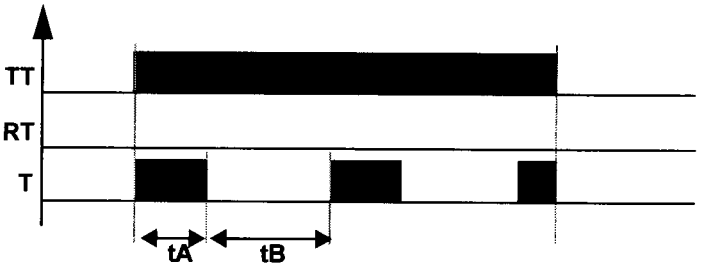
The following diagram shows the operation of the type d timer:



Note: each pulse on the TTx input resets the current timer value to 0.

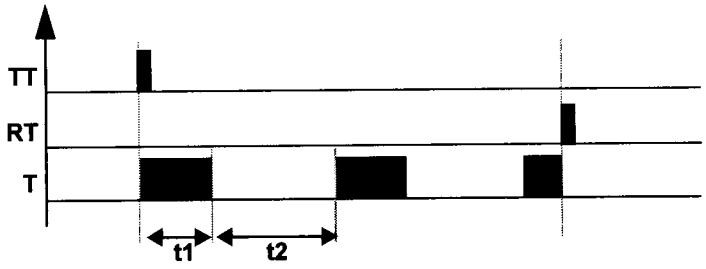
Flasher unit, control held down asynchronously (type L):

The following diagram shows the operation of the type L timer:



Flasher unit, Press to start/stop asynchronously (type I):

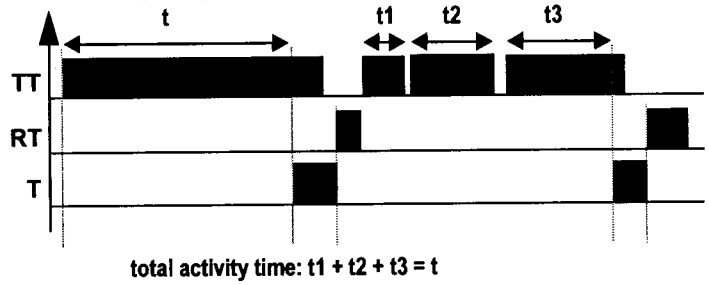
The following diagram shows the operation of the type I timer:



Note: each pulse on the TTx input resets the current timer value to 0.

Time on addition (type T):

The following diagram shows the operation of the type T timer:



With addition type, the preset value can be reached:

- In one step: t,
- In several steps: t1 + t2 + ... + tn.

Modifying the Mode of a Coil or a Contact

To modify the operating mode of a coil or a contact from the front panel of the smart relay (the programming window displayed on screen), simply:

- Position the cursor on the symbol representing the coil mode or on the letter of the contact,
- proceed as described in the paragraph *Modifying an element,, p. 44*, to scroll through the possible modes for a coil or contact types possible (**T** for normally open contact, **t** for a normally closed contact).

Initialization

State of the contacts and current values on initialization of the program:

- The **normally open** mode (direct state) is **inactive**,
- the **normally closed** mode (inverse state) is **active**,
- the **current value(s)** is (are) **zero(s)**.

Example 1

Creating a timer device for a stairway.

The stairway light should remain on for two minutes and thirty seconds when one of the push buttons is activated.

On each floor, the buttons are linked to the **I1** input of the smart relay.

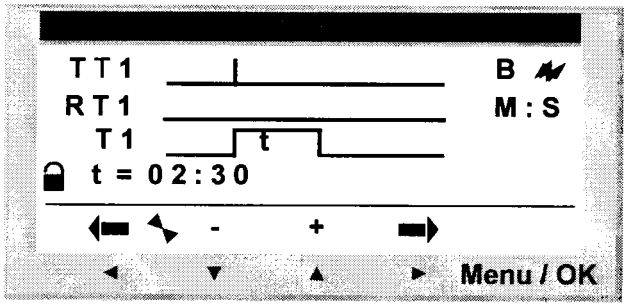
The stairway light is linked to the **Q4** output of the smart relay.

You would write the following program:

```
------I1-------TT1
------I2-------RT1
------T1-------[Q4
```

To obtain the desired operation, you should use a type B timer (On pulse one shot), and configure the duration of the timer for 2 minutes 30 seconds. To thus configure the timer duration, choose the time units **M : S** and enter the value **02:30** for the preset value **t**.

Illustration: Timer's configuration screen:



Counters

Description

The **Counters** function is used to upcount or downcount pulses. The smart relay has 16 timers, numbered from 1 to 9 then from A to G.

The **Counters** function can be reset to zero or to the preset value (depending on the chosen parameter) during use.

It may be used as a contact to find out whether:

- The preset value has been reached (upcounting mode **TO**),
- The counter has reached 0 (downcounting **FROM**).

Use of Coils

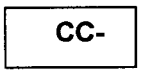
Each timer has 3 associated coils:

- Coil **CC**: **Counting Pulse Input**,
- Coil **RC**: **Reset Initial Counter State Input**,
- Coil **DC**: **Counting Direction input**.

The use of these coils is described below.

Counting pulse input:

Symbol of the Counting Pulse Input coil of a timer:



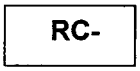
When used as a coil in a control diagram, this element represents a counting input for the function. Every time the coil is energized, the counter is incremented or decremented by 1 according to the counting direction chosen.

Example: Input counting pulses delivered by counter no. 1.

Every time input I1 is energized, the counter no. 1 is incremented by 1.

Reset Initial Counter State input:

Symbol of the Reset Initial Counter State Input coil:

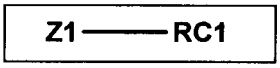


When used as a coil in a control diagram, this element represents an input that resets the counting function to its initial state.

Energizing the coil has the following effect:

- Reset the current count value to **zero** if the count type is **TO** (up-counting from the preset value),
- Reset the current value to the **preset value** if the count type is **FROM** (down-counting from the preset value).

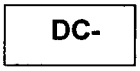
Example: Counter no. 1 reset to zero by pressing Z1 key.



Every time key Z1 is pressed, the counter starts from 0.

Counting direction input:

Symbol of the Counting Direction Input coil of a timer:

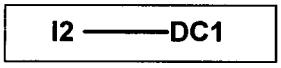


This input determines the counting direction according to its status. It:

- Downcounts if the coil is energized,
- Upcounts if the coil is not energized.

Note: By default, if this input is not wired, the automation function counts.

Example: Up/downcounts, depending on the status of smart relay input I2.



If the **I2** input is active, the automation function downcounts.

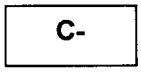
Use as a Contact

The contact associated with the counter indicates whether the preset value (**TO** mode) or zero (**FROM** mode) has been reached.

It may be used as many times as necessary as many times as necessary in the program. It may be used according to 2 modes: normally open or normally closed, described below.

Normally open mode:

Symbol of the normally open contact associated with a counter:

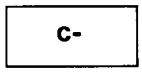


The contact is **conducting when**:

- The current counter value **has reached** the preset value, if the counter is in **TO** mode (upcounting mode),
- The current counter value **is equal to 0**, if the counter is in **FROM** mode (downcounting mode),

Normally closed mode:

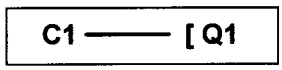
Symbol of the normally closed contact associated with a counter:



The contact is **conducting as long as** :

- The current counter value **has not reached** the preset value, if the counter is in **TO** mode (upcounting mode).
- The current counter value **is not equal to 0** if the counter is in **FROM** mode (downcount mode).

Example: Lighting a LED connected to counter no. 1 output (**TO** mode).



When the preset value has been reached: The LED is lit; otherwise it is off.

Configuration from Front Panel

The block's parameter settings can be accessed either when entering the command line or from the **PARAMETERS** menu if the block has not been padlocked.

The parameters to enter are the following:

- Type of counting,
- Preset value,
- Parameter lock,
- Latching.

Type of counting:

Symbol of the Type of counting parameter:

This parameter is used to select the operating mode of the counter:

- **TO**: upcounting towards the preset value.
  When the counter's current value is equal to the preset value, contact C of the counter is conducting.
- **FROM**: downcounting from the preset value.
  When the counter current value equals 0, counter contact C is conducting.

Preset value:

Symbol of the Preset Value parameter:

This value is between 0 and 32,767, and represents:

- The value to reach in the counting mode to the preset value (**TO** mode),
- the initial value in the downcounting mode from the preset value (**FROM** mode).

Parameter lock:

Symbol of the Parameter lock parameter:

Verrouillé Non verrouillé

Locking prevents the modification of locked parameters from the front panel of the smart relay via the PARAMETERS menu.

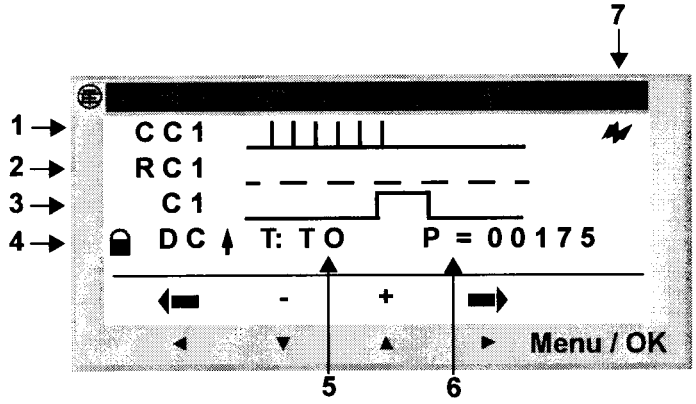
Latching:

Symbol of the Latching parameter:

Activé Non activé

This function is used to save the status of the counter's current values in the event of a power failure.

Illustration: Configuring a counter from the front panel of the smart relay:



Description:

Number	Parameter	Description
1	**Command input**	Control input timing diagram (following pulse).
2	**Reset input**	Counter reset input timing diagram.
3	Counter output	Counter output timing diagram.
4	**Parameter lock**	This parameter is used to lock the counter parameters. When the block is locked, the preset value no longer appears in the PARAMETERS menu.
5	**Type of counting**	Up-counting towards the preset value: **TO** mode or up-counting from the preset value: **FROM** mode.
6	**Preset value**	Counter preset value.
7	**Latching**	Backup of state of the current counter value in the event of a power failure.

Current Counter Value

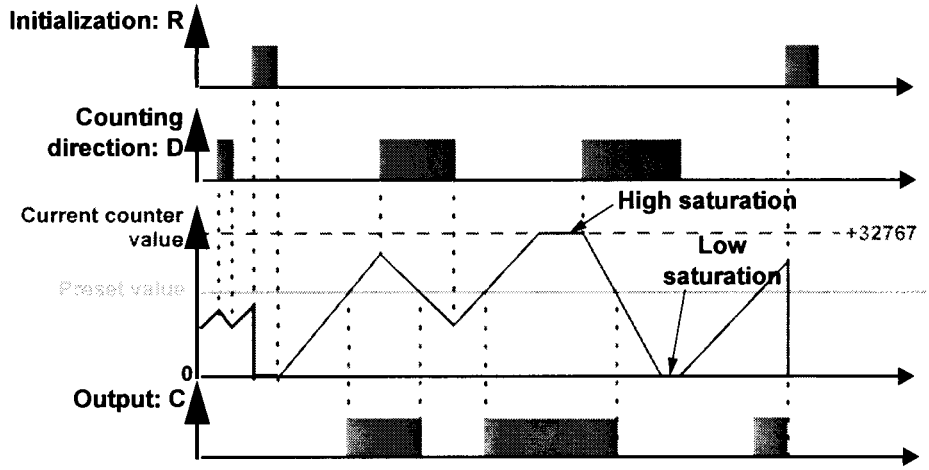
The current value is the value at any given time resulting from the successive up/down counting actions that have occurred since the last time the counter was reset to its initial state.

This value is between 0 and 32767. Once these values have been reached, a down count will leave the value 0 and an upcount will leave the current value at + 32767.

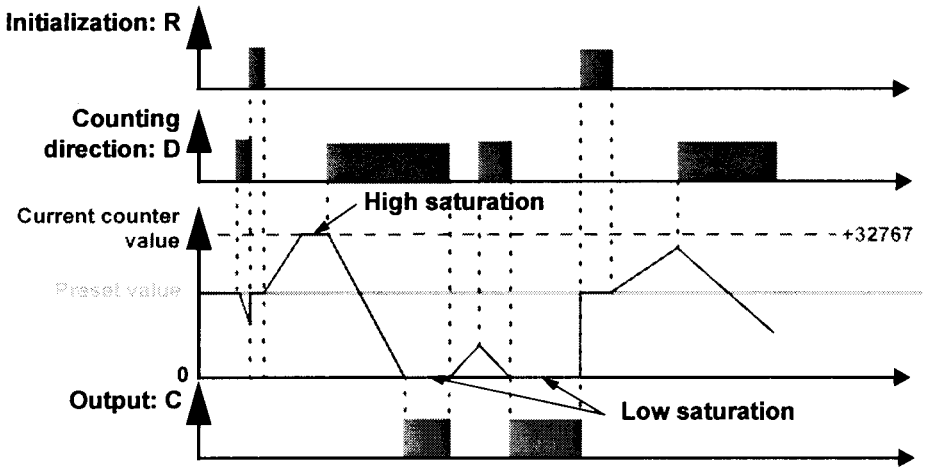
Timing Diagrams

In the timing diagrams the blue curves represent the current value of the counter:

The following figure shows the operation of the counter in up-counting mode with toward the preset value: **TO** mode:



The following figure shows the operation of the counter in upcounting mode from the preset value: **FROM** mode:



Modifying the Mode of a Coil or a Contact

To modify the operating mode of a coil or a contact from the front panel of the smart relay (the programming window displayed on screen), simply:

- Position the cursor on the symbol representing the coil mode or on the letter of the contact,
- proceed as indicated in the paragraph *Modifying an element,, p. 44*, to scroll through the possible modes for a coil or contact types possible (**C** for normally open contact, **c** for a normally closed contact).

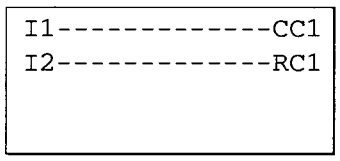
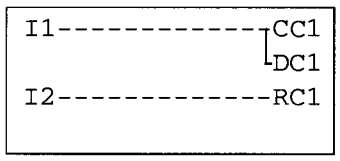
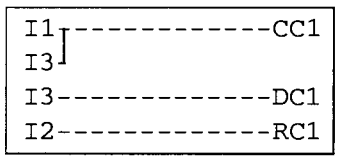
Initialization

Status of the contacts and current value on initialization of the program:

- The **normally open** mode (direct state) is **inactive**,
- The **normally closed** mode (inverse state) is **active**,
- The **current value** is **zero**.

Examples

Below, three simple examples of the use of a counter (configured in upcounting mode toward the preset value):

Screen	Description
	**Upcounting and zero resetting:** The counter is incremented each time input **I1** is activated. The counter is reset each time input **I2** is activated.
	**Downcounting and Resetting:** The counter is decremented each time input **I1** is activated. The counter is reset each time the **I2** input is activated.
	**Upcounting, Downcounting and Resetting:** The counter is incremented each time input **I1** is activated. The counter is decremented each time the **I3** input is activated. The counter is reset each time the input **I2** is activated.

Fast Counter

Description

The **Fast Counter** function is used to count pulses up to a frequency of 1 kHz.

Use of the **K1** contact indicates:

- The preset value has been reached (upcounting),
- The value 0 has been reached (downcounting).

The **Fast counter** inputs are implicitly connected to the **I1** and **I2** smart relay inputs:

- A pulse (rising edge) on the **I1** input increments the counter,
- A pulse (rising edge) on the **I2** input decrements the counter.

These inputs should not be used on the wiring sheet.

The **Fast Counter** function can be reset to zero during use by the **RK1** coil. It is reset to:

- 0 if it is in up-count mode towards the preset value
- the preset value if it is in down-count mode from the preset value.

The counter only operates if the **TK1** confirmation coil is active.

Repetitive mode can be used with a time-delay value.

Note: Limit overrun:

- If the current value of the counter exceeds the upper limit: **+ 32,767**, it is set to **- 32,768**,
- if the current value of the counter exceeds the lower limit: **-32,767**, it is set to **+32,768**.

Note: This function block cannot be simulated.

Use of Coils

Two coils are associated with the fast counter:

- coil **TK1**: **Enable function input**,
- coil **RK1**: **Reset initial counter state input**.

The use of these coils is described below.

Enable function input:

Symbol of the Enable Function Input coil of the fast counter:

This element is used to confirm the counter. When this coil is active, each pulse on the **I1** input will increment the **Fast counter** and each pulse on the **I2** input will decrement it.

Reset initial counter state input:

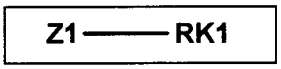
Symbol of the Reset Initial Counter State Input:

This input resets the counter function to its initial state.

Energizing the coil has the following effect:

- reset the current count value to **zero** if the **count type** is **TO** (up-counting from the preset value).
- reset the current value to the **preset value** if the count type is **FROM** (down-counting from the preset value).

Example: Counter reset by pressing on the Z1 key:



Each time the Z1 key is pressed, the counter is reinitialized.

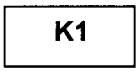
Use as a Contact

The contact associated with the fast counter indicates whether the preset value (**TO** mode) or zero (FROM mode) has been reached.

It may be used as many times as necessary as many times as necessary in the program. It may be used according to 2 modes: normally open or normally closed, described below.

Normally open mode:

Symbol of the normally open contact associated with the fast counter:

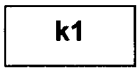


The contact is **conducting when**:

- the current value of the counter has **reached** the **preset value** (**TO** mode),
- the current value of the counter has **reached** the **0 value** (**FROM** mode).

Normally closed mode:

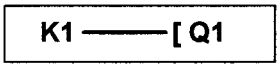
Symbol of the normally closed contact associated with the fast counter:



The contact is **conducting as long as** :

- the current counter value **has not reached** the preset value, if the counter is in **TO** mode,
- The counter current value **has not reached 0**, if the counter is in **FROM** mode,

Example: Lighting a LED connected to fast counter no. 1 output (**TO** mode).



When the preset value has been reached: The LED is lit; otherwise it is off.

Configuration from Front Panel

The block's parameter settings can be accessed either when entering the command line or from the **PARAMETERS** menu if the block has not been padlocked.

The parameters to enter are the following:

- Cycle type,
- Duration of pulse,
- Preset value,
- Type of counting,
- Parameter lock,
- Latching.

Cycle type:

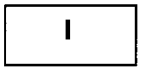
This parameter determines the behavior of the fast counter when it reaches the preset value (when it is in **TO** mode), or when it reaches the value zero (when it is in **FROM** mode):

The cycle type may be:

- **Single**: Reaching the preset value (**TO** mode) or the zero value (**FROM** mode) does not affect the current value of the counter.
  The current counter value changes on an on-going basis. The output is activated when the current value is greater than the preset value (**TO** mode) or when the current value is less than the preset value (**FROM** mode).
- **Repetitive**: In the **TO** mode, the current value is reinitialized when it reaches the preset value and in **FROM** mode, it is reset to the preset value when it reaches zero. The output is enabled following this reinitialization and remains active for a time that may be configured with the parameter: **Duration of pulse** (from 1 to 32,767 times 100 ms).

Duration of pulse:

Symbol of the **Duration of pulse** parameter:

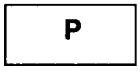


This parameter is only displayed if the cycle is repetitive. It determines the duration during which the fast counter remains active when the current value reaches the preset value (when it is in **TO** mode), or when it reaches the value zero (when it is in **FROM** mode).

This value must be between 1 and 32,767 (x 100 ms).

Preset value:

Symbol of the **Preset value** parameter:



This value is between 0 and 32,767, and represents:

- The value to reach in the counting mode to the preset value (**TO** mode),
- the initial value in the down-count mode from the preset value (**FROM** mode).

Type of counting:

Symbol of the **Type of counting** parameter:

This parameter is used to select the operating mode of the counter:

- **TO**: up-counting towards the preset value.
  When the counter's current value is greater than or equal to the preset value, contact K1 of the fast counter is conducting.
- **FROM**: down-counting from the preset value.
  When the counter's current value is less than or equal to 0, contact C of the counter is conducting.

Parameter lock:

Symbol of the **Parameter Lock** parameter:

Verrouillé Non verrouillé

Locking prevents the modification of locked parameters from the front panel of the smart relay via the PARAMETERS menu.

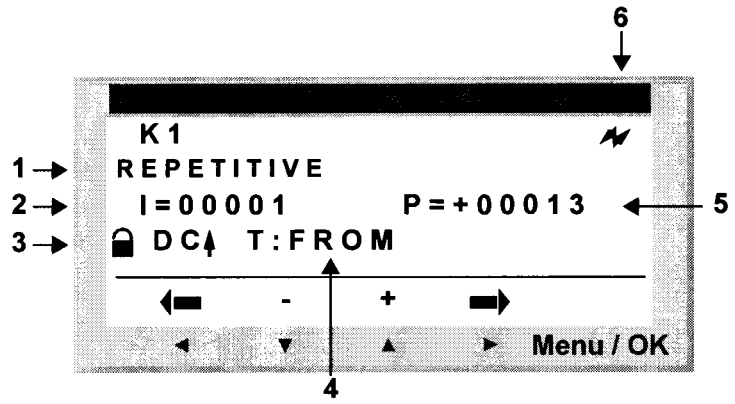
Latching:

Symbol of the **Latching** parameter:

Activé Non activé

This function is used to save the status of the fast counter's current values in the event of a power failure.

Illustration: configuring a counter from the front panel of the smart relay:



Description:

Number	Parameter	Description
1	**Cycle type**	Single/Repetitive
2	**Duration of pulse**	Only if the cycle is repetitive
3	**Parameter lock**	This parameter is used to lock the counter parameters. When the block is locked, the preset value no longer appears in the PARAMETERS menu.
4	**Type of counting**	Counter configuration: Counting to the preset value (**TO**) or from the preset value (**FROM**).
5	**Preset value**	Counter preset value.
6	**Latching**	Backup of state of the current counter value in the event of a power cut.

Current Counter Value

Value at any given instant resulting from successive up/down counts since the last counter reset to its initial state.

If the current value of the counter exceeds the upper limit: +32,767, it is set to -32,768.

If the current value of the counter exceeds the lower limit: -32,767, it is set to +32,768.

Timing Diagrams

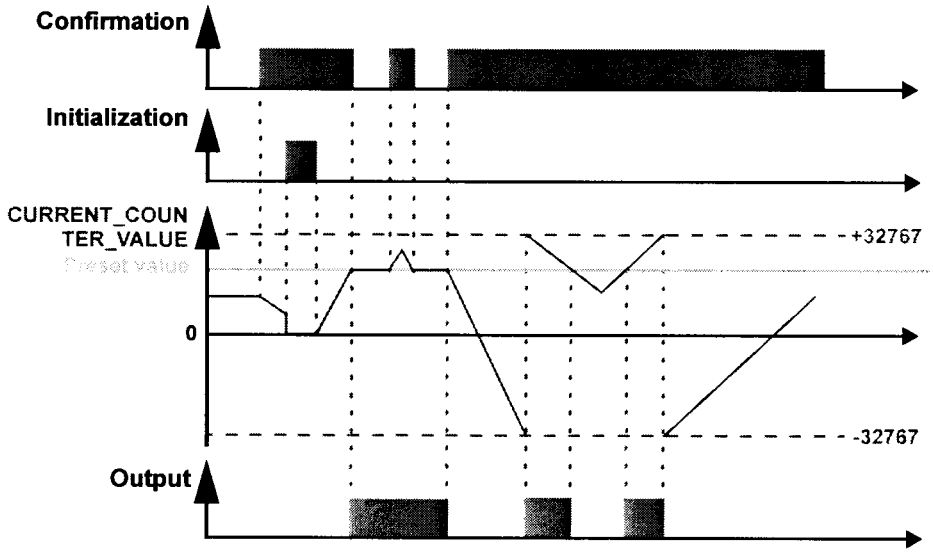
Timing diagrams are provided here to illustrate the various behaviors of the fast counter according to its parameters:

- up-counting function **TO**, in single cycle mode,
- down-counting function **FROM**, in single cycle mode,
- up-counting function **TO**, in repetitive cycle mode,
- down-counting function **FROM**, in repetitive cycle mode.

For the following 4 charts, the blue curve represents the current value of the counter. When it increases, it is because of pulses on I1 and when it decreases, it is because of pulses on I2.

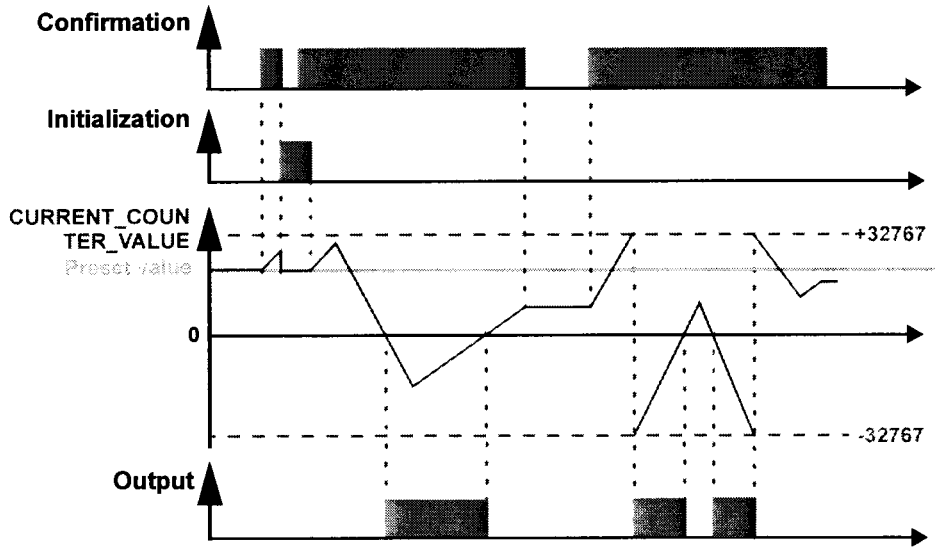
Up-Counting in Single Cycle Mode:

The figure below illustrates the counter function in up-counting and single cycle mode:



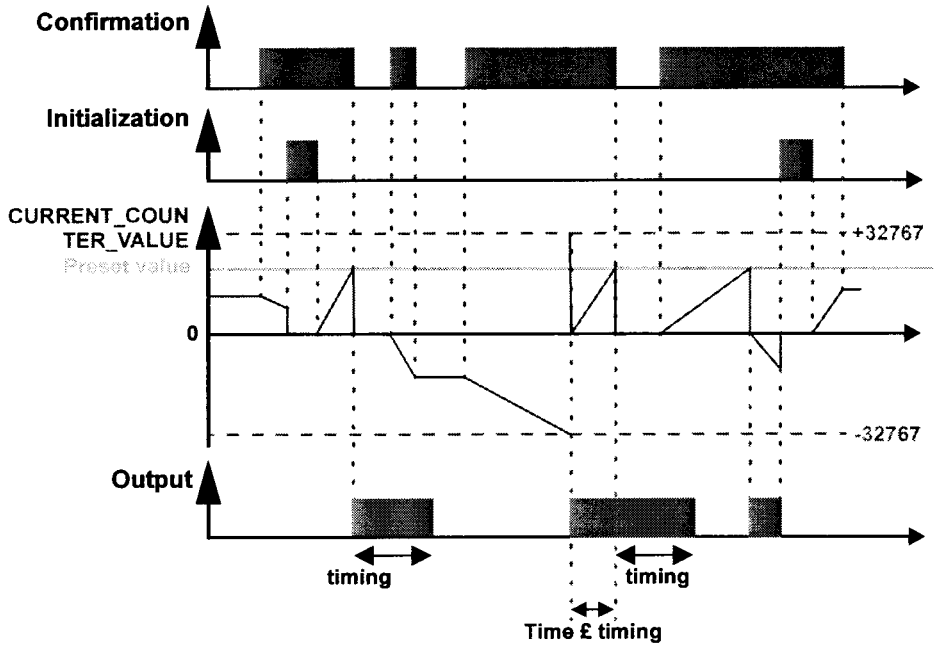
Down-Counting in Single Cycle Mode:

The figure below illustrates the counter function in down-counting and single cycle mode:



Up-counting in Repetitive Cycle Mode:

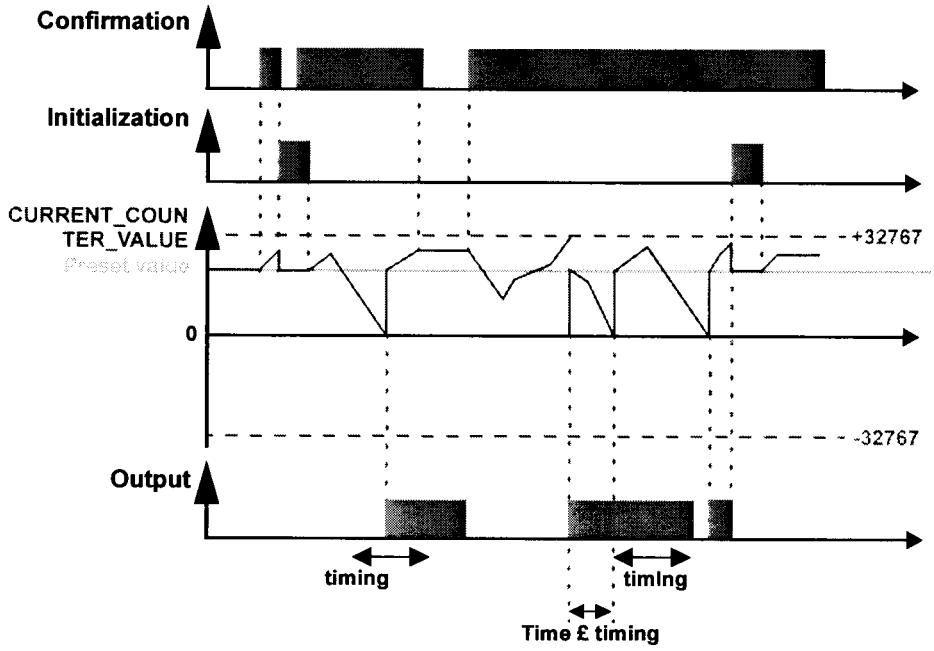
The figure below illustrates the counter function in up-counting and repetitive cycle mode:



The output switches to the **Inactive** state when the predefined pulse duration value has run out. If the switch condition is Active before the switch to the Inactive state, the output pulse is extended by the **Duration of pulse** (Timing).

Down-Counting In Repetitive Cycle Mode:

The figure below illustrates the counter function in down-counting and repetitive cycle mode:



The output switches to the **Inactive** state when the predefined pulse duration value has run out. If the switch condition is Active before the switch to the Inactive state, the output pulse is extended by the **Duration of pulse** (Timing).

Modifying the Mode of a Coil or a Contact

To modify the operating mode of a coil or a contact from the front panel of the smart relay (the programming window displayed on screen), simply:

- Position the cursor on the symbol representing the coil mode or on the letter of the contact,
- Proceed as indicated in the paragraph *Modifying an element,, p. 44*, to scroll through the possible modes for a coil or contact types (**K** for normally open contact, **k** for a normally closed contact).

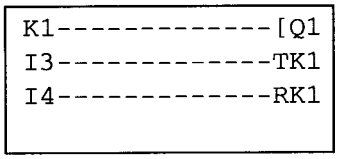
Initialization

Status of the contacts and current value on initialization of the program:

- The **normally open** mode (direct state) is **inactive**,
- the **normally closed** mode (inverse state) is **active**,
- The **current value** is **zero**.

Example

Below, an example of using a fast counter: output Q1 is set to 1 when the fast counter is set to 1; the counter is activated by input I3 and reset to 0 by input I4.



Counter Comparators

Description

This function is used to compare the current counting values of two counters or of a counter and a constant value.

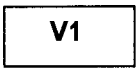
> **Note:** The **Counter Comparators** function block can only be configured from the programming software in **Ladder Entry** mode.
> See on-line help of the programming software for more information.

Use as a Contact

The counter comparator indicates whether the chosen condition is verified. It is used as a contact, in normally open mode or in normally closed mode.

Normally open mode:

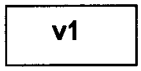
Symbol of the counter comparator, in normally open mode:



The contact is **conducting** when the condition is **verified**.

Normally closed mode:

Symbol of the counter comparator, in normally closed mode:



The contact is **conducting** when the condition **is not verified**.

Configuration from the Front Panel

The **Counter Comparators** function block cannot be configured from the front panel of the smart relay. This function must be configured from the programming software.

See on-line help of the programming software for more information on configuration.

Modifying the Mode of a Coil or a Contact

To modify the operating mode of a coil or a contact from the front panel of the smart relay (the programming window displayed on screen), simply:

- Position the cursor on the symbol representing the coil mode or on the letter of the contact,
- Proceed as described in the paragraph *Modifying an element,, p. 44*, to scroll through the possible modes for a coil or possible contact types (**V** for normally open contact, **v** for a normally closed contact).

Initialization

Status of contacts on program initialization:

- Normally open mode (direct state) is inactive,
- Normally closed mode (reverse state) is active.

Analog Comparators

Description

The **Analog Comparators** function block is used to:

- Compare a measured analog value with an internal reference value.
- Compare two measured analog values.
- Compare two measured analog values with hysteresis parameter.

The result of this comparison is used in the form of a contact.

Analog automation functions can be used for smart relays with a real time clock and DC power supply, and with mixed DISCR/Analog inputs.

The following indicate the existence of mixed Discrete/Analog inputs:

- The existence of inputs numbered from **IB** to **IG** (maximum configuration). These inputs are used to receive analog signals from 0.0 V to 9.9 V inclusively.
- The presence of the **Analog Comparators** function in the toolbar of the programming software.

These smart relays have 16 **Analog Comparators** function blocks, numbered from 1 to 9 then from A to G.

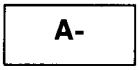
Use as a Contact

The contact shows the position of a measured analog value in relation to a reference value or to another measured value.

It may be used as many times as necessary in the program. It may be used according to 2 modes: normally open or normally closed, described below.

Normally open mode:

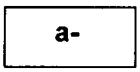
Symbol of the normally open contact associated with a, Analog Comparator:



The contact is **conducting** when the comparison condition is **verified**.

Normally closed mode:

Symbol of the normally closed contact associated with an analog comparator:



The contact is **conducting** when the condition **is not verified**.

Configuration from Front Panel

The simple comparison formula is as follows:

xl <Comparison Operator > x2

The comparison formula, for a comparison with hysteresis:

x1 - H ≤ x2≤ x1 + H

The parameters to enter are the following:

- Values to compare,
- Comparison operator,
- Reference value,
- Hysteresis parameter,
- Parameter lock.

Values to compare:

Symbol of values to compare:

x1 **x2**

These variables are chosen from among the following:

- Numbered analog inputs from IB to IG (maximum configuration),
- Reference value R

Comparison operator:

The comparison operator is chosen using the number in the upper right-hand side of the screen.

The table below provides the correspondence between this number and the comparison formula that will be used:

Number	Comparison formula
1	x1 > x2
2	x1 ≥ x2
3	x1 = x2
4	x1 ≠ x2
5	x1 ≤ x2
6	x1 < x2
7	comparison with hysteresis: x1 - H ≤ x2 ≤ x1 - H

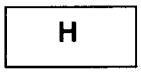
Reference value:

Symbol of the reference value:

The reference value is a constant to which a measured value may be compared. It must be between 0 and 9.9.

Hysteresis parameter:

Symbol of the hysteresis parameter:



The hysteresis parameter is a constant used to define an interval in which the 2x variable should be found for the comparator to be active. Its value must be between 0 and 9.9.

Parameter locking:

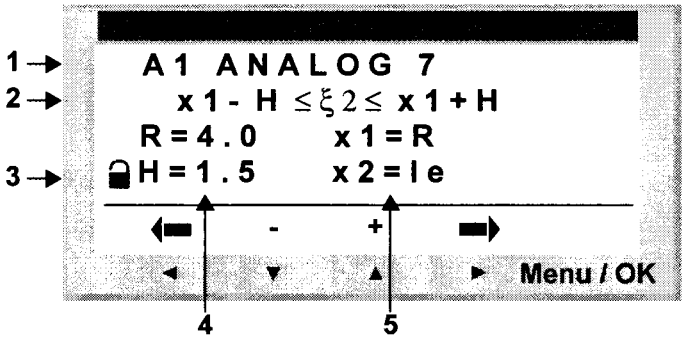
Symbol of the Parameter lock parameter:

Verrouillé Non verrouillé

Locking prevents the modification of locked parameters from the front panel of the smart relay via the PARAMETERS menu.

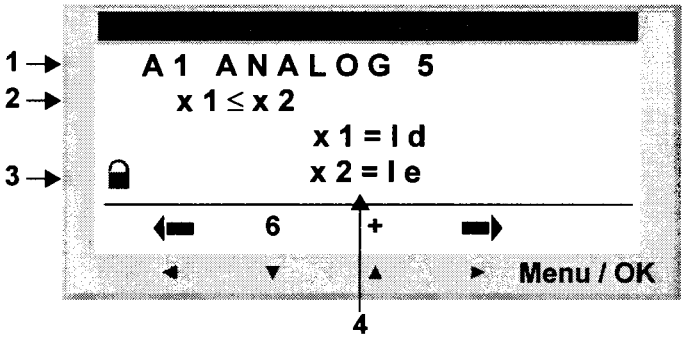
Illustration:

Configuration from the front panel of the smart relay, of the hysteresis-type comparator with constant reference value:



In this case: The comparison condition is verified when the power to the input terminal Ie is between 2.5 Vand 5.5 V.

Configuration of a single comparator from the front panel:



(If neither x1 nor x2 are not set to R, parameter R does not appear.

Description:

Number	Parameter	Description
1	**Type of comparison**	The number that follows ANALOG corresponds to the selected comparison operator.
2	**Comparison formula**	Formula used for comparison.
3	**Parameter lock**	Locking prevents locked parameters from being modified from the front panel of the smart relay using the PARAMETERS menu.
4	**Parameters of the comparison formula**	Parameters of the comparison formula.

Modifying the Mode of a Coil or a Contact

To modify a contact from the front panel of the smart relay (the programming window is displayed on the screen), simply:

- Place the cursor over the letter of the contact,
- Proceed as indicated in the paragraph *Modifying an element,, p. 44*, to scroll through the possible contact types (**A** for a normally open contact, **a** for a normally closed contact).

Initialization

Status of the contacts and current value on initialization of the program:

- The **normally open** mode (direct state) is **inactive**,
- The **normally closed** mode (inverse state) is **active**.

Example

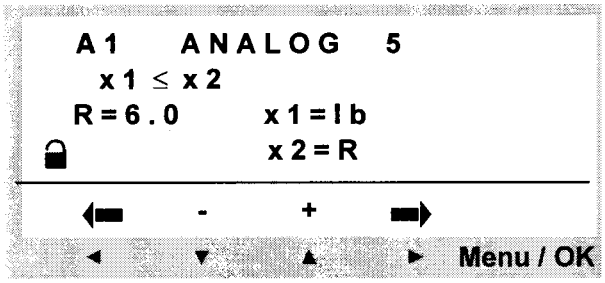
A heating resistance is to be triggered by the smart relay **Q1** output when the temperature is below 20° C.

A temperature probe is used, providing a 0 to 10 volt signal for a -10° to +40° C temperature range. A temperature of 20° C corresponds to a voltage level of 6 volts on the probe.

You would write the following Ladder program:

```
A1-------------[Q1
```

Using the following parameters for the A1 comparator:



The comparison operator no. 5 is chosen, that is ≤.

The values to compare are chosen: The analog input IB (to which the temperature probe is connected) for the first, the reference value R for the second.

The reference value is set to 6.

The analog comparator is thus active when the power measured on the analog input IB is less than or equal to 6 V. This is when the probe measures a temperature less than or equal to 20 °C.

Clocks

Description

Use the **Clocks** function to validate the time ranges during which actions can be executed.

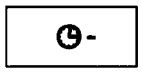
The smart relay has 8 **Clocks** function blocks numbered from 1 to 8. Each of these has four programming ranges and behaves like a weekly programmer. The **Clocks** function blocks are used like contacts.

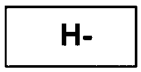
Use as a Contact

This contact may use the direct state of the Clock function block (normally open mode) or its inverse state (mode normally closed), see below.

Normally open mode:

Symbol of the normally open contact, representing a clock:

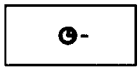


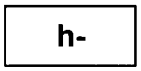


The contact is **conducting** when the clock **is in a validity period.**

Normally closed mode:

Symbol of the normally closed contact, representing a clock:

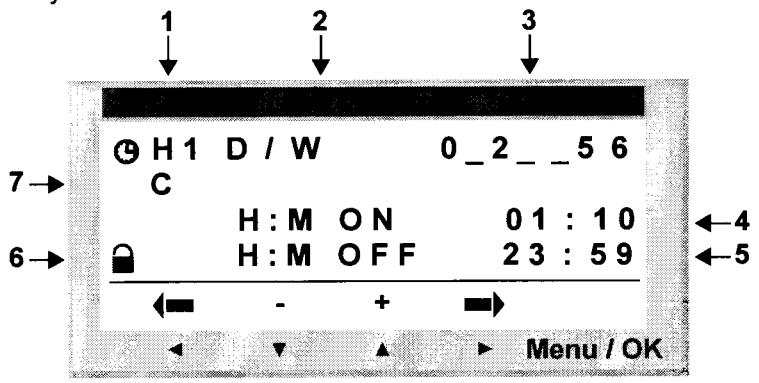




The contact is **conducting** when the clock **is not in a validity period.**

Configuration from Front Panel

Configuration screen of a Clock function block from the front panel of the smart relay:



Number	Parameter	Description
1	**Clock module number**	8 clocks available, numbered 1 to 8.
2	**Type of date configuration**	**D/W**: Days of the Week,
3	**Validity day (D/W type)**	Validity day: • **0**: Monday, • **1**: Tuesday, • ... • **6**: Sunday. **Unselected** days are indicated by a _.
4	**Start time (D/W type)**	This is the operation start time, in **H**our: **M**inute format (00.00 to 23:59).
5	**Stop time (D/W type)**	This is the operation end time, in **H**our : **M**inute format (00.00 to 23:59).
6	**Parameter lock**	Locking prevents locked parameters from being modified from the front panel of the smart relay using the PARAMETERS menu.
7	**Operating ranges**	4 operating ranges are available: A, B, C, D. In operation, these ranges are cumulative: **T**he block is valid over all selected ranges.

If the clock is set to ON on Monday at 23:00 and set to OFF on Monday at 1:00, then it does not change to OFF on Tuesday at 1:00 but effectively on the following Monday at 1:00. Moreover, if no other command has been made, the clock remains positioned at ON all other days of the week.

Combining Modes

Programming modes can be mixed for the same clock.

Example: Using the four clock ranges with different modes.

Range	Program
A: time range	Every day from Monday to Friday, start at 8.00 and end at 18.00.
B: Day/Night	Every day from Tuesday to Thursday: start at 22.00 and end the following day at 6.00.
C: interval	Start on Friday at 20.00.
D: Interval	End on Monday at 03.00.

Modifying the Mode of a Coil or a Contact

To modify the operating mode of a coil or a contact from the front panel of the smart relay (the programming window displayed on screen), simply:

- Place the cursor over the letter of the contact,
- Proceed as indicated in the paragraph *Modifying an element,, p. 44*, to scroll through the possible contact types (**H** for a normally open contact, **h** for a normally closed contact).

Example

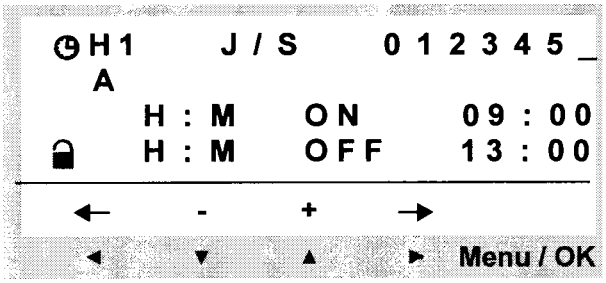
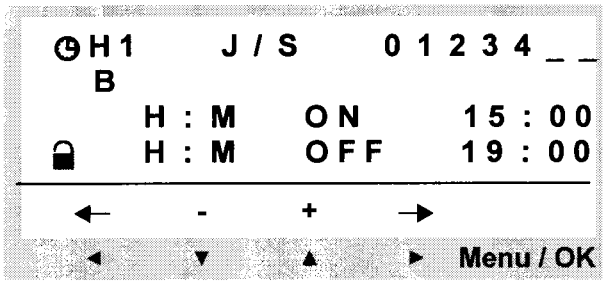
You wish to control a device connected to the Q2 output of the smart relay. You want it to be active on the following two clock ranges:

- from Monday to Saturday, from 09:00 to 13:00.
- from Monday to Friday, from 15:00 to 19:00,

For this, the **H1** Clock block is used and the following wiring diagram is created:

```
H1------------[Q2
```

When entering the H1, Clock block, configure the operational ranges **A and B** as described in the table below:

Screen	Comment
	**First Slot A**: From Monday to Saturday, from 09:00 to 13:00.
	**Second Slot B**: From Monday to Friday, from 15:00 to 19:00,

Texts

Description

The **Text** automation function is used to display texts and/or digital values (current value, preset value, etc.) on the LCD instead of the inputs-outputs screen.

The smart relays have 16 **Text** blocks, numbered from 1 to 9 then from A to G. These function blocks are used as coils.

The maximum number of variables that can be displayed per **Text** block is 4.

Up to 16 **Text** blocks may be used (TX1 to TXG) simultaneously in one program, but only the block with the highest number is displayed.

Pressing the **Shift** and **Menu/OK** keys in order and simultaneously, switches the display from the **Text** screen to the inputs-outputs screen.

Pressing the two keys again simultaneously returns the display to the **Text** screen.

Note: The **Text** blocks are only programmable from the programming software (see the on-line help for the programming software for more information).

Used as a Coil

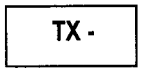
Two coils are associated with each **Text** block:

- **Display Activation** coil,
- **Display Deactivation** coil.

The use of these coils is described below.

Display Activation

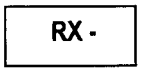
Symbol of the Display Activation coil of a **Text** function block:



This coil displays on the screen the text and/or the values of the associated **Text** block when the contacts that are connected are conducting.

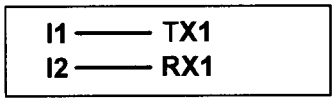
Display deactivation

Symbol of the Display Deactivation coil of a **Text** function block:



This coil deactivates the display of the text and/or the values of the associated **Text** block when the contacts that are connected are conducting. The display returns to the inputs-outputs screen.

Example:



Activation of input **I1** displays the text on the LCD. Activating input **I2** makes the text disappear.

Parametering

The **Text** function blocks are only programmable from the programming software, see the on-line help for the programming software for more information.

LCD Screen Backlighting

Description

The **LCD screen backlighting** output is used to control the backlighting of the LCD by a program.

In STOP and RUN modes, the LCD screen is lit for 30 seconds when the user presses any of the buttons on the front panel.

Used as a Coil

Used as a coil, it lights up the LCD when the contacts to which it is connected are conducting.

Symbol of the coil of the LCD screen Backlighting function:

The screen is lit if this coil is active.

Change to Summer / Winter Time

Description

The output of this function is in an OFF state over the entire duration of winter time, and switches to ON for the entire duration of summer time.

By default, there is no change in winter / summer time. This function must be activated, either from the programming software, or from the front panel of the smart relay.

To activate this function, from the programming software, proceed as follows:

- display the **Program configuration** window: **:Edit** → **Program Configuration** menu,
- Select the **Date format** tab,
- Check the **Activate Summer/Winter Time Change** box,
- Define the time change dates:
  - Either using one of the predefined geographic zones,
  - Or by manually configuring the date (month/Sunday).

To activate this function from the front panel of the smart relay, proceed as described in chapter *CHANGE SUMMER/WINTER Menu, p. 99*.

Note: This function is only available for smart modules that contain a real-time clock.

Access

This function is accessible from the **LD** function bar.

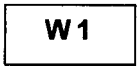
Use as a Contact

When used as a contact, this element indicates the current season.

It may be used as many times as necessary in the program. It may be used according to 2 modes: normally open or normally closed, described below.

Normally open mode:

Symbol of the normally open contact associated with a Change summer / winter time function block:



The contact is active for the entire duration of summer time.

Normally closed mode:

Symbol of the normally closed contact associated with a Change summer/winter time function block

The contact is active for the entire duration of winter time.

Parameters

The following operating modes are possible:

- **No**: no change,
- Automatic change: Dates are preset according to geographic zone:
  - **EUROPE**: Europe,
  - **USA**.
- **OTHER ZONE**: The change is automatic, but you must specify the month: **M** and the Sunday: **S** (1, 2, 3, 4 or 5) on which the summer/winter change takes place.

Modifying the Mode of a Coil or a Contact

In the programming software, to modify the state of a contact, simply position the cursor on it, then:

- With the mouse: right-click to display a list of possible states (left-click to validate),
- With the space bar: Scroll through all possible states.

To modify a contact from the front panel of the smart relay (the programming window displayed on screen), simply:

- Place the cursor over the letter of the contact,
- Proceed as indicated in the paragraph *Modifying an element,, p. 51*, to scroll through the possible contact types (**W** for a normally open contact, **w** for a normally closed contact).

Initialization

State of the contacts and current value on initialization of the program:

- The **normally open** mode (direct state) is **inactive**,
- The **normally closed** mode (inverse state) is **active**.

Modbus Inputs/Outputs

Description

A Modbus **SR3 MBU01BD** extension module may be added onto an extensible smart relay.

In **LD** mode, the application cannot access the four 16-bit data exchange words. Data transfer between master and slave is implicit and completely transparent.

Note: The Modbus module only operates in Modbus slave mode.

Parameters

The Modbus module can be configured only from the programming software (see the on-line help of the programming software for more information).

Words to be sent to master

Writing these words to the master is automatically performed by duplication of the status of the discrete I/Os as follows:

	IG	IF	IE	ID	IC	IB	IA	I9	I8	I7	I6	I5	I4	I3	I2	I1	Modbus Address(Hexa)
	0	0	0	0	0	0	0	0	IR	IQ	IP	IN	IL	IK	IJ	IH	0x0014
	0	0	0	0	0	0	QA	Q9	Q8	Q7	Q6	Q5	Q4	Q3	Q2	Q1	0x0015
	0	0	0	0	0	0	0	0	0	0	QG	QF	QE	QD	QC	QB	0x0016
	0	0	0	0	0	0	0	0	0	0	QG	QF	QE	QD	QC	QB	0x0017
	Most significant byte															Least significant byte	

I1 to IG: discrete input states for the SR3 B261BD base.

IH to IR: discrete input states for the SR3 XT141BD extension.

Q1 to QA: Discrete output states for the SR3 B261BD base.

QB to QG: Discrete output states for the SR3 XT141BD extension.

Words sent by the master.

The words sent by the master are not processed by the smart relay.

These 4 16-bit words have the following addresses (Hexa): 0x0010 / 0x0011 / 0x0012 / 0x0013.

Message

Description

When activated, the **Message** function block can be used to:

- Send alarm messages to mobile phones, the Zelio Logic Alarm alarm operations tool or Email addresses via the SR2COM01communication interface
- Provide remote access to a DISCR and/or a digital variable for reading or modifying them.

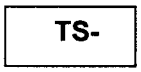
There are 28 **Message** function blocks numbered from S1 to S9, then from SA to SV.

Note: The **Message** function is only available on smart relays with clocks and when a SR2COM01 communication interface is added.
For further information on the configuration of the SR2COM01 communication interface, see the programming software on-line help.

Use of the Coil

Command input

Symbol of the Command Input coil of a **Message** function block:



This coil sends the configured alarm message in the associated **Message** function block, when it is activated.

Depending on the configuration of the **Message** function block, the coil may be activated during detection on its input, by a transition:

- From Inactive to Active State (by default),
- From Active to Inactive State.

See on-line help for the programming software for more information on configuring the **Message** function block.

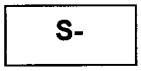
Use as a Contact

The contact associated with the **Message** function block indicates whether the function block is activated.

It may be used as many times as necessary as many times as necessary in the program. It may be used according to 2 modes: normally open or normally closed, described below.

Normally open mode:

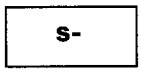
Symbol of the normally open contact associated with a **Message** function block:



The contact is **conducting when** the function block **is activated.**

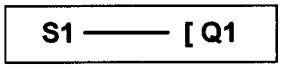
Normally closed mode:

Symbol of the normally closed contact associated with a **Message** function block:



The contact is **conducting as long as** the function block **is not activated.**

Example: Lighting-up of a LED connected to the **Message** No.1 function block output



When function block no. 1 is activated, the associated alarm message is sent and the LED lights up, otherwise it is off.

Modifying the Mode of a Coil or a Contact

To modify the operating mode of a coil or a contact from the front panel of the smart relay (the programming window displayed on screen), simply:

- Position the cursor on the symbol representing the coil mode or on the letter of the contact,
- Proceed as described in the paragraph *Modifying an element,, p. 44*, to scroll through the possible modes for a coil or contact types possible (**S** for normally open contact, **s** for a normally closed contact).

Configuration from the Front Panel

The **Message** function block cannot be configured from the front panel of the smart relay. This function must be configured from the programming software.

See on-line help of the programming software for more information on configuration.

Initialization

Status of contacts on program initialization:

- The **normally open** mode (direct state) is **inactive**,
- The **normally closed** mode (inverse state) is **active**.

Creating and Debugging an Application

IV

Presentation

Subject of this Section

This section describes, using detailed examples, how to create, debug and save an application.

What's in this Part?

This part contains the following chapters:

Chapter	Chapter Name	Page
17	Implementing a Basic Application	149
18	Debugging an Application	165
19	Backup and Transfer of Ladder Diagrams"	175
20	Sample Application	177

Implementing a Basic Application

17

Presentation

Subject of this Chapter

This chapter describes in detail the implementation of a basic application from the front panel of the smart relay.

What's in this Chapter?

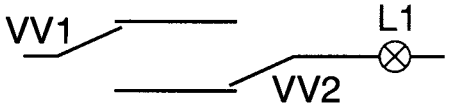
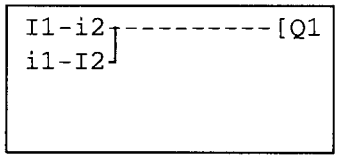
This chapter contains the following topics:

Topic	Page
Presentation of Ladder Diagrams	150
Using the Reverse Function	152
Notation Used by the Smart Relay	155
Application: Implementing a Two-way Switch	157

Presentation of Ladder Diagrams

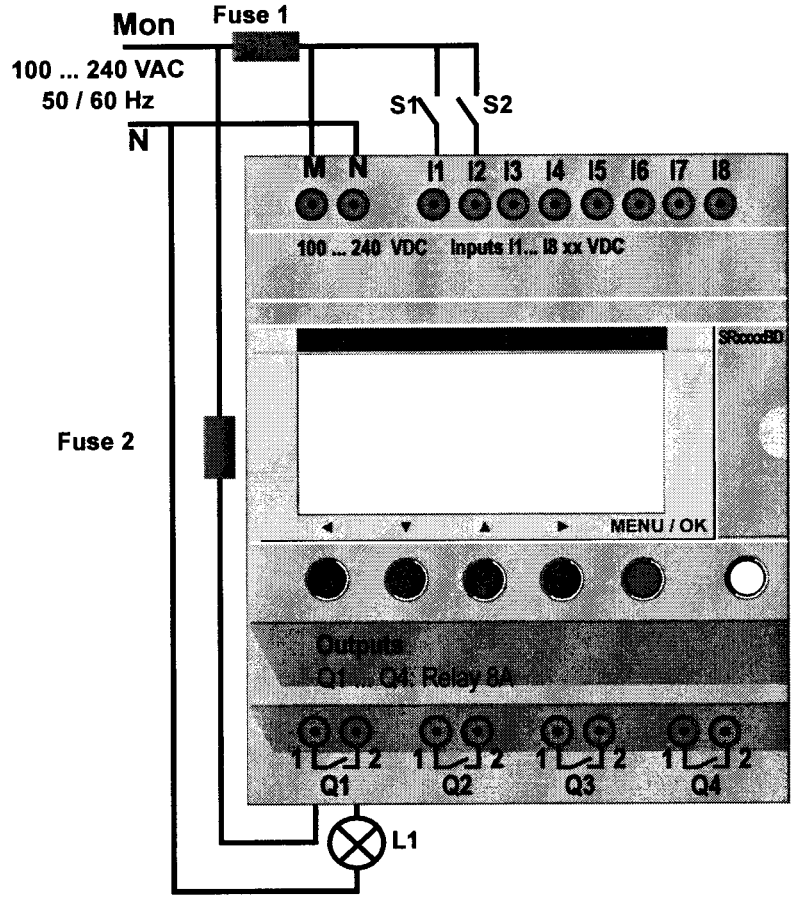
Description

In this section, we will use a simple example to understand how a ladder diagram works: A two-way switch.

Normal electrical diagram	Ladder diagram
	
The two position switches **VV1** and **VV2** control turning lamp **L1** on and off.	**I1** and **I2** are two contacts representing inputs 1 and 2 on the smart relay. **Q1** is a coil that corresponds to output 1 from the smart relay.

Module Wiring

Below, an illustration of smart relay wiring:



Application Operation

Using a smart relay means that ordinary switches (with open or closed positions) can be used in place of two position switches.

The switches are identified as **S1** and **S2** in the wiring diagram above.

S1 and **S2** are connected to inputs **I1** and **I2** on the smart relay.

The operating principle is as follows: Each time the status of inputs **I1** and **I2** changes, the status of output **Q1** also changes which controls the lamp **L1**.

The ladder diagram uses basic functions, for example placing contacts in parallel and in series, as well as the reverse function identified as **i1** and **i2** (see *Using the Reverse Function, p. 152*).

Note: The implementation of a two-way switch is optimum when impulse relay coils are used (see *Discrete (DISCR) Outputs, p. 98*).

Using the Reverse Function

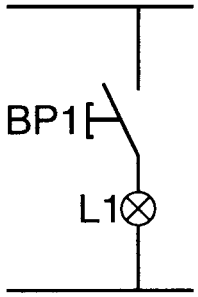
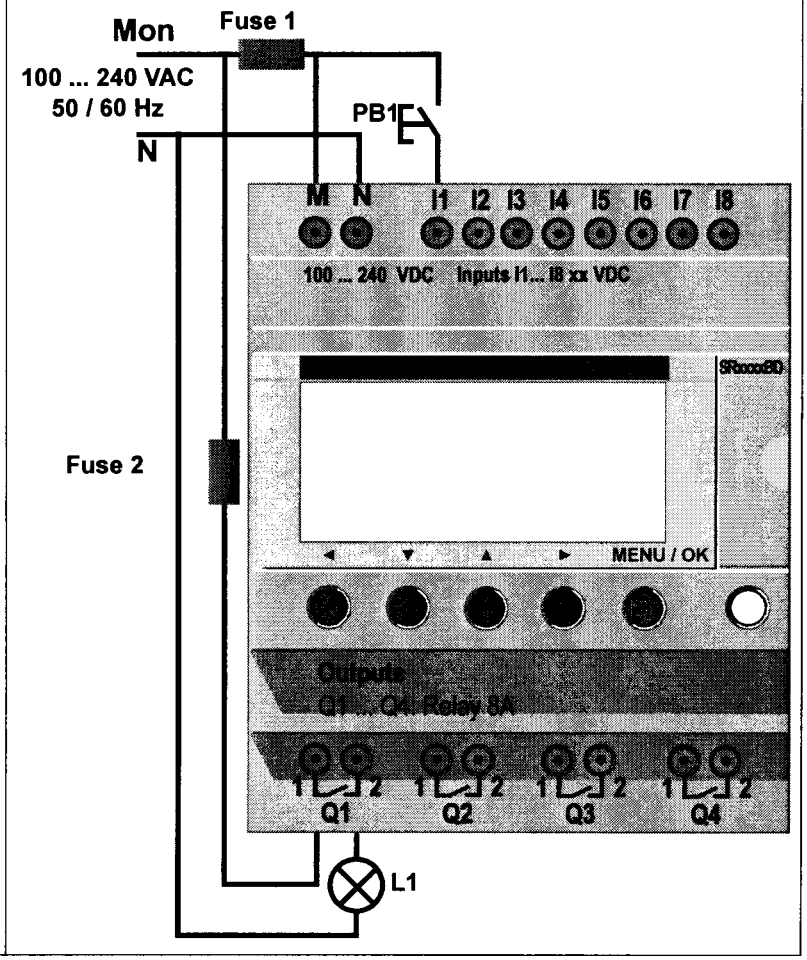
Description

The reverse function, noted **i** in the smart relay is used to obtain the reverse state of input **I** wired on the smart relay.

To illustrate how this function works, we shall use a simple example:

Practical Example

Below is the electrical diagram of the example and an illustration of the smart relay wiring:

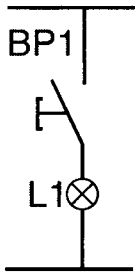
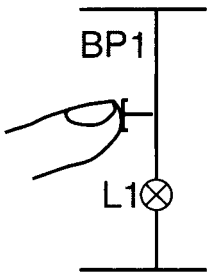
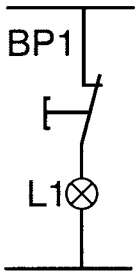
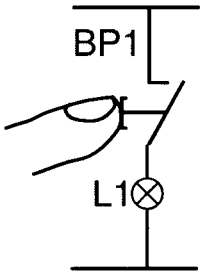
Electrical diagram	Connection to the smart relay
	

Depending on the ladder diagram, two solutions are possible:

Ladder diagram 1: Light off when idle	Ladder diagram 2: Light on when idle
I1----------[Q1	i1----------[Q1
I1 corresponds to the true image of **BP1**, pressing **BP1** activates input **I1**, so that the **Q1** output is activated and the lamp **L1** turns on.	**i1** corresponds to the reverse image of **BP1**, pressing **BP1** activates input **I1** and therefore contact **i1** is disabled, output **Q1** is disabled and the lamp **L1** turns off.

General Case

The table below illustrates the operation of a pushbutton connected to the smart relay. Pushbutton **BP1** is connected to input **I1** and lamp **L1** is connected to output **Q1** on the smart relay.

	Off delay		Operating	
	Electrical diagram	**Smart relay symbols**	**Electrical diagram**	**Smart relay symbols**
Pushbutton normally open		I1 = 0 i1 = 1		I1 = 1 i1 = 0
Pushbutton normally closed		I1 = 1 i1 = 0		I1 = 0 i1 = 1

Note: The reverse function may be applied to all of the contacts in a ladder diagram, whether they represent outputs, auxiliary relays or function blocks.

Notation Used by the Smart Relay

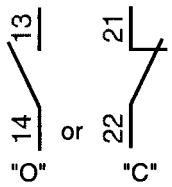
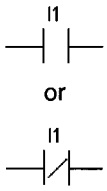
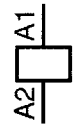
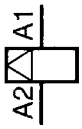
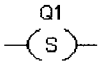
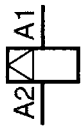
Description

The smart relay has a four line display used to show ladder diagrams.

Note: The programming software allows you represent ladder diagrams in three different formats:
- Electrical symbols,
- Ladder symbols,
- Smart relay symbols,

Equivalencies Between Notations

In the table below are the equivalencies between representations of the most common elements of the ladder language, in the 3 formats:

Electrical symbol	Ladder symbol	Smart relay symbols
		I1 or i1 I1 or i1
		[Q1
 Set coil (SET)		SQ1
 Reset coil (RESET)		RQ1

Other Elements

Other elements are also available using a smart relay, such as:

- **Timer function block**: Used to delay, prolong and control and action for a set length of time,
- **Counter function block**: Used to count the pulses received on an input,
- **Clock function block**: Used to trigger or release actions on precise days or at precise times,
- **Analog comparator function block**: Used to compare an analog value with a reference value or with another analog value after allowing for a hysteresis factor,
- **Auxiliary relays**: These are used to save or relay the status of the smart relay,
- **Zx keys**: After confirming this function, Z keys may be used as pushbuttons,
- **Fast counter function block**: The fast counter function is used to count pulses up to a frequency of 1 kHz.
- **LCD screen back-light function block**: This is used to control the backlighting of the LCD by a program,
- **Summer/winter time change function block**: The output of this function is in an OFF state over the entire duration of winter time, and switches to ON for the entire duration of summer time,
- **Counter Comparator block**: This function is used to compare the current counting values of two counters,
- **Text block**: This is used to display text or numerical values (current value or preset value).

Note: Blocks **Counter Comparator** and **Text** are not programmable from the front panel.

Note: For the list of all ladder diagram elements available when using smart relays, as well as details on their functions and parameters, see the chapter entitled *LD Language Elements, p. 87.*

Application: Implementing a Two-way Switch

Description

In the text that follows you will find detailed information on the procedure for entering a ladder diagram for a two-way switch.

You should proceed as follows:

- Go to the programming screen,
- Enter the contacts in the first line,
- Enter the coil in the first line and join it to the contacts,
- Enter the contacts in the second line,
- Join the second line to the first,
- Launch the program.

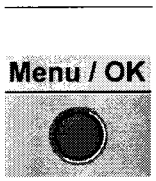
From the main screen (the one shown on power-up), follow the instructions in the **Action** column and press the specified button.

The **Screen** column shows what the user will see on the smart relay display screen.

The **Comments** column provides some additional information on entry and display actions.

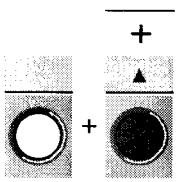
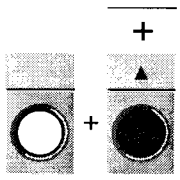
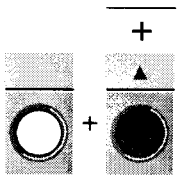
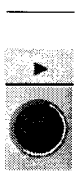
Go to the Programming Screen

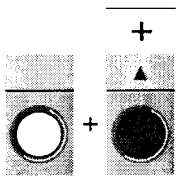
To access the screen from which we will program the two-way switch, proceed as follows:

Step	Action	Screen	Comment
1		PROGRAMMING PARAMETERS RUN/STOP CONFIGURATION	Position the cursor on PROGRAMMING; it will flash when selected.
2		▮ LINE 2 LINE 3 LINE 3	After briefly displaying: **LINE 1** (for approx. two seconds), a ▮ flashing cursor is displayed.
3		ins - + Del.	Pressing and holding down the **Shift** key (white) will make a contextual menu appear that is used for programming the contacts and the coils.

Entering the Contacts in the First Line

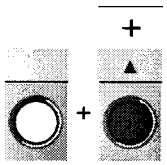
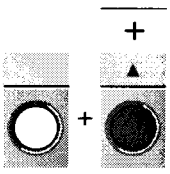
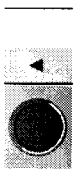
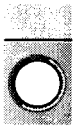
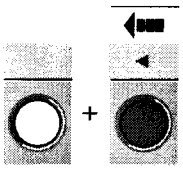
To enter the contacts in the first line, proceed as follows:

Step	Action	Screen	Comment
1		I1	The ▮ flashing cursor is positioned on the **I**. The smart relay prompts you to select the type of contact.
2		I1	The **1** flashes. The user has implicitly selected a contact assigned to an input (I), the smart relay now prompts the user to select the input number.
3		I1•	The • flashes, indicating a link point for linking connections.
4		I1 ▮	The ▮ flashes. You just confirmed entry of the contact associated with the input **I1**. The ▮ is positioned for entering the second contact.
5		I1-I1	The right side **I** will begin flashing. The smart relay prompts you to select the type of contact.
6		I1-i1	The **i** flashes. You have just selected the reverse contact assigned to an input.
7		I1-i1	The **1** on the right flashes. Now enter the input number.

Step	Action	Screen	Comment
8		I1-i2	The **2** flashes.

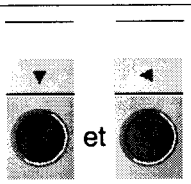
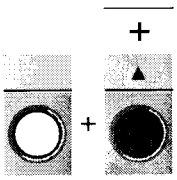
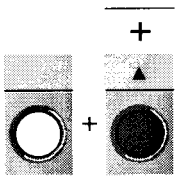
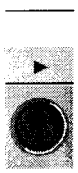
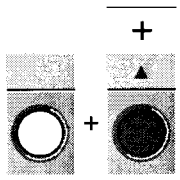
Entering the Coil and Joining it to the Contacts

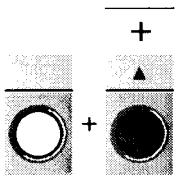
To enter the coil in the first line and connect it to the coils, proceed as follows:

Step	Action	Screen	Comment
1	11 fois	I1-i2● I1-i2 ▮ ... then I1-i2 ▮	The cursor flashes in succession: • At a link point: ●, • At a contact point: ▮. Until positioned at the end of the line ready to enter the coil.
2		I1-i2 [M1	The **[** flashes.
3		I1-i2 [M1	The **M** flashes.
4		I1-i2 [Q1	The **Q** flashes.
5	 2 fois	I1-i2 ●[Q1	The cursor ● is displayed.
6			Pressing and holding down the **Shift** key (white) will make a contextual menu appear that is used for programming the connections.
7	 3 times	I1-i2●---------[Q1	The link is created.

Entering the Contacts in the Second Line

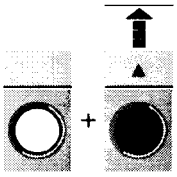
To enter the contacts in the second line, proceed as follows:

Step	Action	Screen	Comment
1	 et as many times as necessary until positioned at the start of the line.	I1-i2----------[Q1 ▮	The ▮ is at the start of the following line.
2		I1-i2----------[Q1 I1	The **I** located on the second line flashes.
3		I1-i2----------[Q1 i1	The **i** located on the second line flashes.
4		I1-i2----------[Q1 i1	The **1** located on the second line flashes.
5	2 fois	I1-i2----------[Q1 i1 ▮	The ▮ flashes.
6		I1-i2----------[Q1 i1-I1	The **I** located on the second line flashes.

Step	Action	Screen	Comment
7		I1-i2----------[Q1 i1-I1	The second **1** in the second line flashes.
8		I1-i2----------[Q1 i1-I2	The **2** located on the second line flashes.

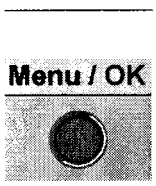
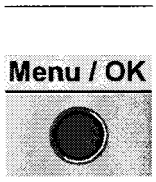
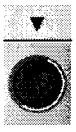
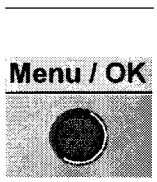
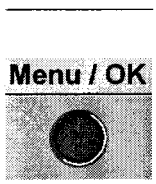
Joining the Second Line to the First

To join the second line to the first, proceed as follows:

Step	Action	Screen	Comment
1		I1-i2----------[Q1 i1-I2●	The ● flashes. This shows that it is possible to connect a link at this point.
2		I1-i2┌---------[Q1 i1-I2┘	The ● has changed into a | which creates the link between the two lines.

Launching the Program

To launch the program, proceed as follows:

Step	Action	Screen	Comment
1		VALIDER MODIFS.? OUI NON	Now confirm the changes. **YES** flashes.
2		PROGRAMMATION PARAMETRES RUN/STOP CONFIGURATION	The main menu re-appears. **PROGRAMMING** is selected (flashes).
3	 2 fois	PROGRAMMATION PARAMETRES RUN/STOP CONFIGURATION	**RUN/STOP** is selected (flashes).
4		RUN PROG ? OUI NON	Now start the program.
5		1234 BCDE RUN LD JEU 25 SEP 16:40 1234	The main menu re-appears.

The Basic Points

This simple application example teaches the user how to enter a ladder diagram.

The following points should be remembered:

- When a ▮ or a • is flashing, use the **Shift** button to add an element (contact, coil or graphic link element),
- When an element is flashing (**I**, **Q**, No., ▮ etc.), it is possible to use the **Shift** + **Z2** and **Z3** arrows on the arrow keypad to select the required element,
- It is also possible to use the **Z1** to **Z4** arrows on the arrow keypad to move around the ladder diagram.

Debugging an Application

18

Presentation

Subject of this Chapter

This chapter presents the tools available for debugging an application loaded in the memory of the smart relay.

What's in this Chapter?

This chapter contains the following topics:

Topic	Page
Introduction	166
Dynamic Mode Ladder Diagrams	168
Dynamic Mode Function Block Parameters	170
Dynamic Mode Menus	171
Smart Relay Reaction to a Power Failure	172

Introduction

Module in RUN Mode

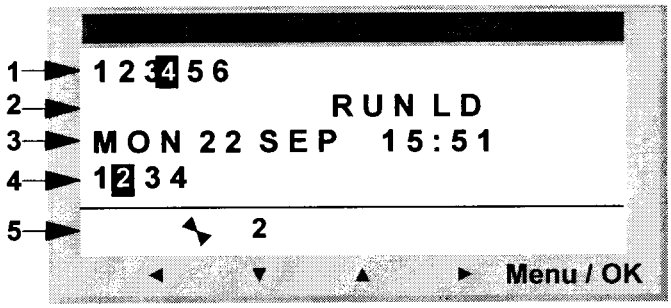
Once an application has been entered in ladder diagram form, debugging tests still must be run.

The first step is to set the smart relay to RUN. To do this, in the RUN/STOP option in main menu and select RUN.

From this moment on, the smart relay handles the physical inputs and outputs according to the instructions entered in the ladder diagram.

Viewing Status:

In RUN mode, the states of inputs and outputs are displayed on the main screen:



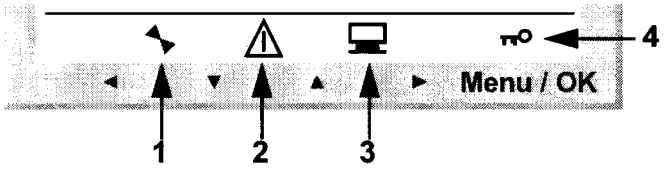
Prompt	Element
1	Display input status
2	Display run mode (RUN/STOP) and mode in use.
3	Displays date and time for products with clocks.
4	Output status display.
5	Contextual menus / pushbuttons / icons indicating operating modes.

When inputs or outputs are activated, they appear in reverse video (using white on a black background).

This concept is referred to as the dynamic operation of smart relay functions. The terms **RUN** and **dynamic** have a similar meaning in the remainder of this document.

Contextual Menus

Below is an illustration of the icons in the contextual menu when the smart relay is in RUN mode:



Prompt	Element
1	Status of the smart relay: In RUN it is in motion, in STOP it is immobile.
2	Indicates that faults have appeared (see *FAULT Menu, p. 77*).
3	Indicates that the smart relay is connected to the programming software.
4	The key indicates that the program is password-protected.

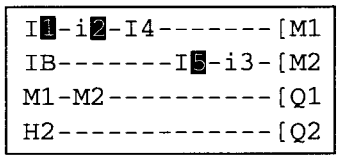
Dynamic Mode Ladder Diagrams

Viewing Ladder Diagrams

Note: This function can be accessed only in LD/ RUN mode.

The smart relay can dynamically display the performance of a ladder diagram. To do this, simply call up the **MONITORING** menu and position the cursor over the lines to display using the navigation keys.

Each conducting contact or energized coil is displayed in reverse video mode (white on black):



To change smart relay performance, the user may change or view some of the function block parameters.

Changing Ladder Diagrams

It is ABSOLUTELY IMPOSSIBLE to change ladder diagram lines in RUN mode.

It is however possible to change function block parameters in **MONITORING** mode.

Using Z Keys as Pushbuttons

On the INPUTS-OUTPUTS screen in RUN mode, the numbers of the Z keys used in the program are displayed in the contextual menu. Press and hold down the **Shift** key to display this menu.

To enable a Z key, press on the button located under the number.

Illustration:

Note: The **Zx keys** function is disabled in **PARAMETERS** and **MONITORING** modes and in all of the function block parameter screens and configuration screens.

Dynamic Mode Function Block Parameters

Presentation

In RUN mode a function block preset value may be changed dynamically if it is not locked.

Functions with parameters in LD mode:
- Auxiliary relays (latching),
- Discrete Outputs (latching),
- Clocks
- Analog comparators,
- Timers
- Counters
- Fast counters.

Functions with parameters in FBD mode:
- Numerical constant-type inputs,
- Clock,
- Gain,
- Timers: TIMER A/C, TIMER B/H, TIMER Li,
- Counter: PRESET COUNT / UP DOWN COUNT,
- H-SPEED COUNT fast counter,
- PRESET H-METER hour counter,
- CAM block.

Accessing / Modifying parameters

Parameters may be accessed from the following screens:
- **PARAMETERS**: See *PARAMETERS Menu, p. 51*,
- **MONITORING**: on the ladder diagram.

To modify the parameters of an element from the MONITORING screen, proceed as follows:

Step	Action
1	Position the cursor on the element you would like to modify using the navigation keys.
2	At the same time, hold down **Shift** and the **Param** key to open the parameter window.
3	Position the cursor on the modifiable parameter fields using the navigation keys: ◄ ►.
4	Modify the value of the parameter using the ▲ and ▲ (+ and -) keys, holding down **Shift**.
5	Confirm the modifications by pressing **Menu/OK**, which will open the confirmation window. Confirm a second time by pressing **Menu/OK** to save.

Note: Only the parameters of unlocked blocks may be modified.

Dynamic Mode Menus

Dynamic Mode Menus

Some menus are accessible when the smart relay is in RUN mode, while others are not. Here is a summary table.

Menu		LD	FBD
PROGRAMMING			
MONITORING		✓	
PARAMETERS		✓	✓
RUN / STOP		✓	✓
CHANGE D/H		✓	✓
CHANGE SUMM/WINT		✓	✓
CONFIGURATION			
	PASSWORD		
	FILTER		
	Zx KEYS		
	WATCHDOG CYCLE		
CLEAR PROG.			
TRANSFER			
VERSION		✓	✓
LANGUAGE		✓	✓
FAULT		✓	✓

Smart Relay Reaction to a Power Failure

Description

A power failure may cause the smart relay to restart and lose any data not saved.

Smart relays have the ability to save the current time for at least 10 years.

In addition, it is also possible to back up the variables configured with the **Latching** option defined in the parameters window.

Latching

The **Latching** function is used to save the state of the counter's current values in the event of a power failure.

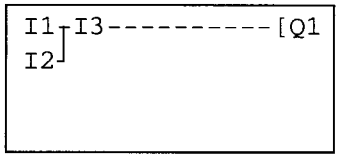
The blocks that have this function are the following:

- In LD mode:
  - Auxiliary relays,
  - Discrete outputs,
  - Timers
  - Counters
  - Fast counter,
- In FBD mode:
  - AC, BH, Li timer,
  - Cam programmer function CAM BLOCK,
  - PRESET COUNT, UP DOWN COUNT counter,
  - PRESET H-METER hour counter,
  - Data archiving function ARCHIVE,
  - Fast counters.

Safety Mode

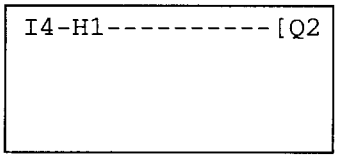
If the result of losing the time setting is to lock coil control, then simply use a clock contact without a stop order in series with the action coils.

Example of a **non**-locked coil:

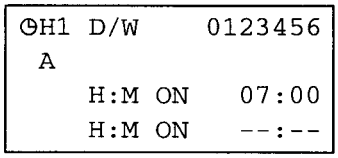


The contact line for coil Q1 will be active even if the time and date setting is lost.

Example of a locked coil:



With the clock function block 1 configured as follows:



The contact line for coil Q2 will only be active after setting the clock.

Backup and Transfer of Ladder Diagrams"

19

Saving and Transferring Ladder Diagrams

Description

It is possible to transfer a ladder diagram from the smart relay toward a backup memory (optional) and vice-versa.

This allows:

- To backup an application, then restore it later on if necessary,
- To make a copy of an application for loading it in several smart relays.

Transferring an Appllcation

Transferring an application from a smart relay to the backup memory, or from the backup memory to the smart relay, is performed using the menu: **TRANSFER**.

The procedure is described in detail in the chapter **TRANSFER Menu**, see *TRANSFER Menu, p. 67.*

Sample Application

20

Presentation

Subject of this Chapter

In this chapter we'll use the example of an underground car park control. From given specifications, we will develop the application to program in the smart relay.

What's in this Chapter?

This chapter contains the following topics:

Topic	Page
Specifications	178
Specification Analysis	179
Implementing the Solution	181

Specifications

Objective

We wish to complete and centralize the control of the underground car park of an administrative building.

Automatic Gate

The entrance and the exit of the car park are controlled by an ordinary automatic gate.

The gate has the usual basic features such as:

- Gate timing (opening and closing) by passing vehicles,
- Ticket payment management,
- Safety telephones,
- External control for locking in closed position, etc.

Counting Vehicles

In addition, we would like to keep track of vehicles parked in the facility.

We would thus be able to control a lighted panel that informs drivers when all parking spaces are occupied and prevents access by locking the gate in the closed position. Drivers would then know to look for a parking space elsewhere.

It must also be possible to override this function when necessary to allow access for emergency services (fire department, emergency medical service, etc.).

Open Time

We would also like to prevent access to the facility when the building is closed.

Security personnel should be allowed to prevent the gate from locking in non-ordinary circumstances. The hours of opening are the following: Monday to Friday from 8:30 am to 5:30 pm, Saturday from 9:30 am to 12:00 noon and closed all day Sunday.

Removal of Toxic Gasses

For safety reasons, it is also necessary to remove toxic emissions such as carbon dioxide by using a fan when the measured concentration levels exceed permissible levels.

A specialized sensor will be used that provides an output value between 0 and 10V.

Lighting

There is also a requirement to control lighting, triggered by a vehicle arriving and via pushbutton switches placed near all of the pedestrian access points.

To save energy, lights will turn off after 10 minutes. This is the length of time generally observed for someone to park and exit their vehicle and take the elevator, or return to their vehicle and exit the park facility.

Manual Counting

In addition, a manual action should be able to provide current information on the number of vehicles parked in the facility. Someone should be able to manually increase or decrease the number of vehicles known by the smart relay.

Specification Analysis

Description

Analysis of the specifications includes listing inputs, buttons, outputs and function blocks necessary to complete the application.

Inputs

Below is the list of inputs that the application will use:

Smart relay label	Name
Input **I1**	Vehicle entry detection.
Input **I2**	Vehicle exit detection.
Inputs **I3** and **I4**	Pushbuttons at pedestrian access points. They are used to light the facility. One for the elevator and one for the stairway (no pedestrian access is allowed via the vehicle entrance).
Analog input **IB**	CO_2 level sensor.

Button

Below is the list of buttons that the application will use:

Smart relay label	Name
Function key **Z1**	Manually increments the number of vehicles in the car park.
Function key **Z2**	Resumes automatic entry control.
Function key **Z3**	Manually decrements the number of vehicles in the car park.
Function key **Z4**	Manually releases the entrance barrier.

Outputs

Below is the list of outputs that the application will use:

Smart relay label	Name
Output **Q1**	Indicates when the car park facility is full.
Output **Q2**	Locks the entry barrier (inhibits entry barrier opening) when the car park is full or outside of opening hours.
Output **Q3**	Manually releases the entrance barrier.
Output **Q4**	Controls the polluted air extraction fan control.

Special function blocks

Below is the list of special function blocks that the application will use:

Smart relay label	Name
Counter **C1**	Counts the number of vehicles in the car park (93 maximum).
Clock function block **H1**	Manages car park access hours.
Timer function block **T1**	Lighting timer (10 minutes).
Analog function block **A1**, the authorized threshold value corresponds to 8.5 Volts.	Compares the CO2 level measured with the allowable threshold.
Timer function block **T2**	Fan timer (15 minutes).

Note: To implement this solution, a smart relay with analog inputs, clock function blocks and at least 4 discrete inputs and outputs.

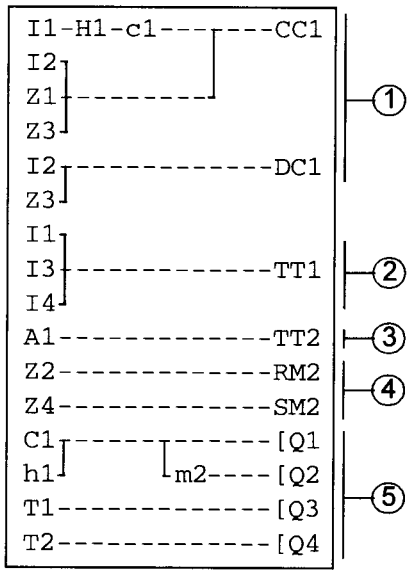
Implementing the Solution

Description

Presented here are the control diagrams to program, as well as the parameters to use for the function blocks.

Implementing the Ladder Diagram

Below is the control diagram to program:



Prompt	Element
1	Counting vehicles in, subtracting vehicles out and manually updating the number of vehicles actually in the car park.
2	Starting the lighting timer.
3	Starting the fan timer.
4	Handling the manual release function.
5	Outputs command: Car park full indicator, blocking the input, lighting the car park and running the extraction fan.

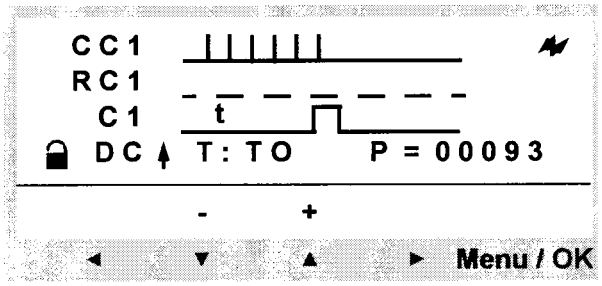
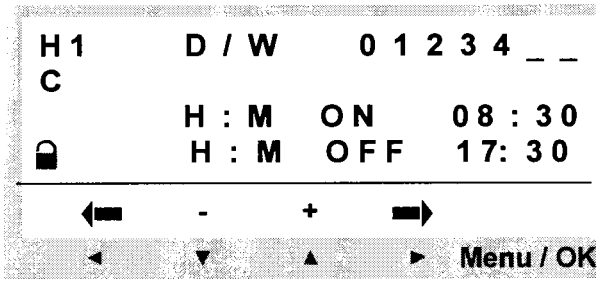
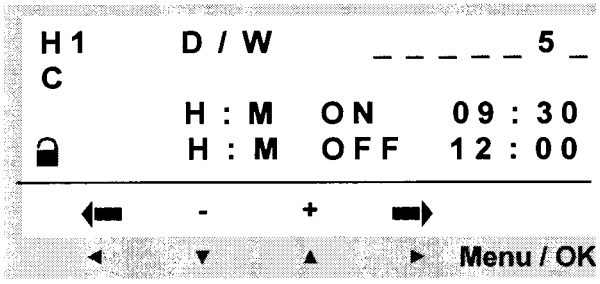
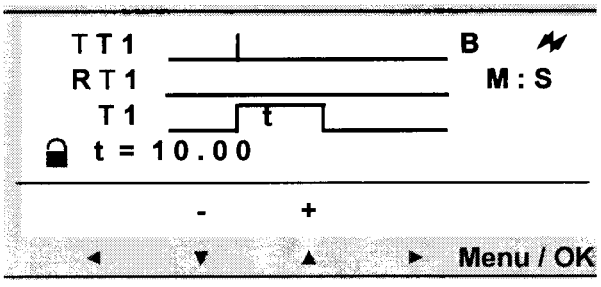
When upcounting and downcounting, the counter locks up when the car park becomes full (no spurious detection or counting actions take place if vehicles are allowed to enter by manual release).

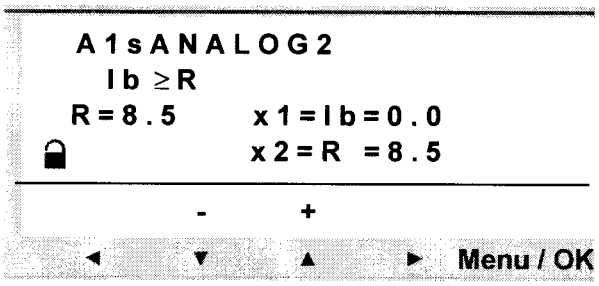
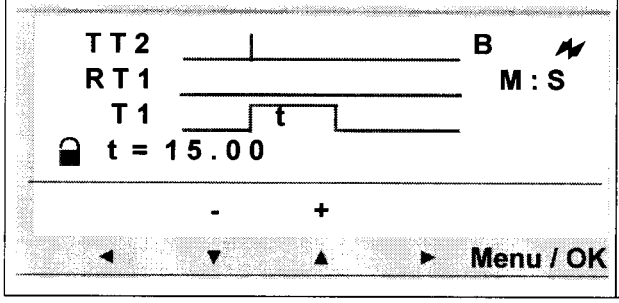
Note: For a given counter, the coils **CC** and **DC** should only appear once in a ladder diagram.

In addition, output **Q2** is activated when entry into the car park is not allowed. This leads to the use of an auxiliary relay to manually lock or unlock the access gate using the navigation keys.

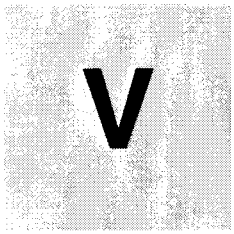
Configuring the Function Blocks

The table below provides details on the parameters to use for each of the function blocks:

Function block	Comment
Counter function block **C1** 	The preset value is 93 (the maximum number of vehicles allowed in this car park). Where necessary, this value may be changed during operation.
Clock function block **H1**  	Open hours: • Monday to Friday from 8:30 am to 5:30 pm. • Saturdays from 9:30 am to 12:00 noon. • Closed all day Sundays. Two ranges are used.
Timer function block **T1** 	Car park lighting timer: 10 minutes.

Function block	Comment
Analog function block **A1** 	Compares the measured CO_2 level with the threshold value: 8.5 V.
Timer function block **T2** 	Fan operating duration if the CO_2 threshold is exceeded. 15 minutes.

Diagnostics



Presentation

Subject of this Section

This chapter will help you find solutions to operating problems.

What's in this Part?

This part contains the following chapters:

Chapter	Chapter Name	Page
21	Diagnostics	187

Diagnostics

21

Presentation

Subject of this Chapter

This chapter will help you find solutions to operating problems.

What's in this Chapter?

This chapter contains the following topics:

Topic	Page
Smart Relay Messages	188
Frequently Asked Questions	189

Smart Relay Messages

Description Here is detailed information on the error messages that are returned by the smart relay, their possible causes and how to remedy the problem.

Error Messages The table below lists the error messages that a smart relay could return. These messages generally indicate incompatible actions requested by the user.

Message	Cause	Corrective action
NO PARAMETER	The user has requested to access the **PARAMETERS** option when no parameter is available (the diagram does not include any elements with parameters).	
TRANSF.ERR.	A transfer was in progress and the link with the PC was unexpectedly interrupted.	See the documentation for the programming software.
TRANSFER ERROR: NO MEMORY	A transfer to the EEPROM was requested and the EEPROM is not present or incorrectly located.	Check the presence and correct location of the EEPROM.
TRANSFER ERROR: CONFIG INCOMPAT	The user has requested to transfer a program that does not match the characteristics of the target smart relay, for example: Clock, analog input, software version.	Check the origin of the program to transfer and choose a program that is compatible with the appropriate smart relay.
TRANSFER ERROR: VERSION. INCOMPAT	This error appears if one of the versions of the smart relay does not correspond to: Firmware, LD or FBD functions	Check the firmware version used.
Outputs are displayed flashing on the main screen	One or more static outputs have shorted or overloaded.	Troubleshoot, then stop the smart relay to end the blinking before selecting RUN mode again (automatic reset).

Frequently Asked Questions

Description

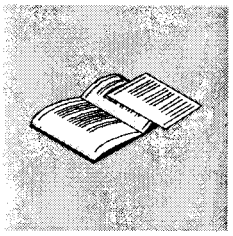
To assist the user in understanding the smart relay, the most frequently asked questions are listed here.

Frequently Asked Questions

Here below are the most frequently asked questions and their answers:

Question	Answer
I cannot access some parameters.	Some parameters are not accessible. See the documentation to find out whether these elements can be changed. Example of an element that cannot be changed: Counter function block counting direction. This element is only accessible by wiring in a ladder diagram line.
I still cannot access some parameters.	To access the parameters, you must use the navigation keys ◄ and ► to position the cursor above them. The ▼ and ▲ are used to change these values. Then press **Menu/OK** to confirm the changes.
I cannot RUN my smart relay even though I enable the RUN/STOP option in the main menu using the **Menu/OK** key.	CAUTION, make sure that the error symbol (!) is not displayed in the contextual menu line. Correct the error in order to RUN the smart module.
I would like to change my diagram lines but the **Menu/OK** key no longer works.	Ensure that the smart relay is indeed stopped. Changes in RUN mode are not allowed.
When I try to change my diagram lines, the smart relay shows me a screen with only line numbers (LINE No.). Have I lost all my work?	Not necessarily, this situation may occur when 4 consecutive blank lines have been inserted at the start of the ladder diagram or between the command lines.
I have a ladder diagram that uses the Z key (◄, ▼, ▲, ►) for a pushbutton. I would like to test it but when I display the diagram dynamically, my Z key is no longer operational. Can I make it work?	No this is impossible.
I generated a ladder diagram on a smart relay with a clock. Can I use a backup memory to transfer it to a smart relay without clock?	No this is impossible.
When entering a ladder diagram, the clock function blocks do not appear when choosing the contacts. Is this normal?	It is quite possible that the smart relay is one without a clock. Consequently, the clock function blocks are not accessible. Check the product reference numbers.
When entering a ladder diagram, the analog function blocks do not appear when choosing the contacts. Is this normal?	It is quite probable that the smart relay does not have analog inputs. Consequently, the analog function blocks are not accessible. Check the product reference numbers.

Appendices



At a Glance

Introduction

This section contains product-related appendices.

What's in this Appendix?

The appendix contains the following chapters:

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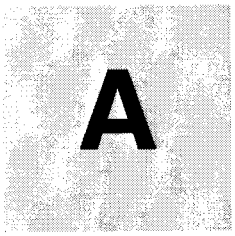
Compatibility



At a Glance

Subject of this Chapter

This appendix provides information on the compatibility between the versions of the firmware, the versions of the programming software and the different memory cartridges.

What's in this Chapter?

This chapter contains the following topics:

Topic	Page
Compatibility between the version of the programming software and the version of the firmware on the smart relay	194
Compatibility between the memory cartridges and the version of the firmware on the smart relay	195

Compatibility between the version of the programming software and the version of the firmware on the smart relay

Introduction

The section below describes the compatibility between the versions of the programming software and the versions of the firmware on the smart relay.

In the Case of a Transfer of the Program from the PC to the Smart Relay

In the case of a transfer of the PC program to the smart relay, all the versions of the programming software are compatible with all the versions of the firmware on the smart relay.

During transfer of the PC program to the smart relay, the firmware associated with the version of the programming software is transferred to the smart relay.

In the Case of a Transfer of the Program from the Smart Relay to the PC

In the case of a transfer of the program from the smart relay to the PC, compatibility between the version of the programming software and the version of the firmware on the smart relay is as follows:

		Smart relay firmware version		
		V2.xx	V3.xx	V4.xx
Version of the programming software	V2.4	Compatible	Incompatible	Incompatible
	V3.1	Incompatible	Compatible	Incompatible
	V4.1	Incompatible	Incompatible	Compatible

Compatibility between the memory cartridges and the version of the firmware on the smart relay

Introduction

The section below describes the compatibility between the memory cartridges and the versions of the firmware on the smart relay.

Compatibility of the Memory Cartridge with the Version of the firmware

The table below describes the compatibility of the memory cartridges with the version of the firmware:

Type of memory cartridge	Version of firmware compatible
SR2 MEM01	LD Language: V2.19 or lower. FBD Language: V2.18 or lower.
SR2 MEM02	V3.0.9 or higher.

Transferring a Program from the SR2 MEM01 Memory Cartridge to the Smart Relay

In the case of a transfer of the program from the SR2 MEM01 memory cartridge to the smart relay, compatibility is as follows:

		Smart relay firmware language	
		LD	FBD
Memory cartridge program language	LD	Compatible if the versions of the memory cartridge and smart relay match.	The LD firmware version must be transferred to the smart relay.
	FBD	The FBD firmware version must be transferred to the smart relay.	Compatible if the versions of the memory cartridge and smart relay match.

Transferring a Program from the SR2 MEM02 Memory Cartridge to the Smart Relay

In the case of a transfer of the program from the SR2 MEM02 memory cartridge, compatibility is always true:

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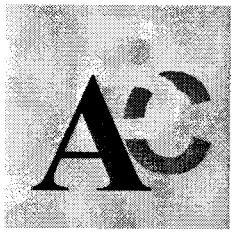

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SR2MAN01EN

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APPENDIX E
Preventative Maintenance Matrix

Site 1, Former Drum Marshalling Area
Soil Vapor Extraction Containment System
NWIRP Bethpage, NY

PREVENTATIVE MAINTENANCE MATRIX

EQUIPMENT DESCRIPTION	ITEM	ACTIVITY	FREQUENCY
Flow Monitoring Station	Valves Gauges Port Seals	Check for leaks, inspect condition of handles Check and clean Check for leaks and replace if necessary	Monthly Monthly Monthly
Moisture Separator Tank M-1	High Level switch Tank insides	Check, clean, and verify calibration Clean bottom and tank walls if necessary	Quarterly Semi-annually
Air Filters F-1 and F-2	Filter elements	Check if clean and replace as necessary	Monthly
Differential Pressure Gauge DPI-101	Instrument	Check if functioning properly	Monthly
Blowers B-1A and B-1B	Fan Motor and Bearings	 Clean motor frame and shaft Replace automatic electronic lubricator when empty as per manufacturer's instructions	Annually Monthly Quarterly or as required based on visual indication
Condensate Pump P-1	Pump Motor and Bearings	Inspect impeller and clean Clean motor frame and shaft Lubricate bearings Check as per manufacturer's instructions	Annually Monthly Semi-annually
Soil Vapor Extraction Blowers Discharge Flow Meter FQIT-101	Instrument	Check if functioning properly	Monthly
Vapor-phase Granulated Activated Carbon Vessel VGAC-1	Vessel insides Lining Supports Screen	Inspect the insides of the vessel, the lining, supports and screen	Every carbon replacement
Cleanout Ports # 1 through # 5	Caps and Seals Ports	Inspect and replace if necessary Remove any condensate and clean	Quarterly Quarterly
Pressure/Vacuum Switches PSL-101 and PSH-101	Low Vacuum Switch High Pressure Switch	Check if functioning properly Check if functioning properly	Monthly Monthly
High Temperature Switch TSH-101	High Temperature Switch	Check and verify calibration	Quarterly
Valves	Valves	Check for leaks, inspect condition of handles Inspect seals and seats	Monthly Annually
Piping	Piping and supports	Check piping for leaks, check condition of supports	Monthly
Soil Vapor Pressure Monitors	Caps and Seals	Inspect and replace if necessary	Semi-annually
Soil Vapor Extraction Wells	Caps and Seals	Inspect and replace if necessary	Semi-annually
Auto-Dialer	Interlock shutdowns	Check if functioning properly	Monthly